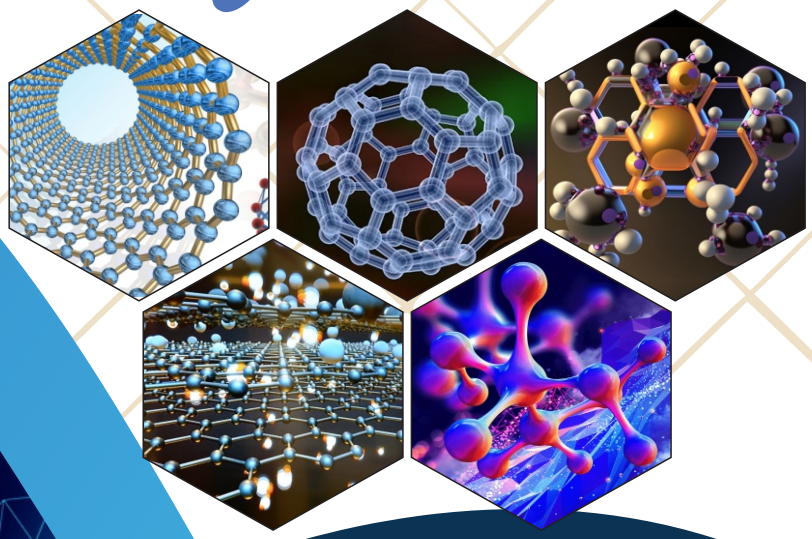
International Conference on Innovations in Science for Sustainable Development

(Sustainable & Innovative Materials in Chemical, Physical and Biological Sciences)

ICISSD-2025

Souvenir



DATE

19 - 20

MARCH, 2025

Organized By

Smt. Narsamma Hirayya Shaikshanik Trust's,

Smt. Narsamma Arts, Commerce and Science College,

Kiran Nagar, Amravati. India – 444606

Research Committee and Department of Chemistry

In Collaboration with

Association of Chemistry Teachers (ACT), Mumbai

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Dr Mangesh s. Tihile

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श्रीमती नरसम्मा हिरय्या शैक्षणिक ट्रस्ट, अमरावती

पी.टी.र.नं. अे.-१२५४ (अमरावती)

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जावक क्र. NHST/ /202 दिनांक : _____

To

The Principal,

Smt. Narsamma Arts, Commerce and Science College,

Kiran Nagar, Amravati. India - 444606

Subject: Greetings and Appreciation for organizing the International Conference on Innovations in Science for Sustainable Development.

Dear Dr. Rajesh Chandanpat,

On behalf of Smt. Narsamma Hirayya Shaikshanik Trust, Amravati, I extend my heartfelt congratulations to Research Committee and Department of Chemistry, Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. for successfully organizing the International Conference on Innovations in Science for Sustainable Development. This initiative is a commendable effort in fostering research, collaboration, and innovative solutions to address global sustainability challenges.

Science and innovation play a crucial role in shaping a sustainable future, and it is inspiring to see your institution take the lead in providing a platform for scholars, researchers, and industry experts to exchange knowledge and ideas. The commitment and dedication of your faculty, students, and organizing committee in making this event a success are truly appreciated.

I am confident that the conference will contribute significantly to advancing scientific research and sustainable development practices. Smt. Narsamma Hirayya Shaikshanik Trust, Amravati is proud to be associated with such an esteemed initiative, and we look forward to supporting and collaborating on future endeavours that promote academic excellence and societal progress.

Wishing you continued success in your entire academic and research pursuits.

Best regards,

Shri. Chandrashekhar Bhondu

President

Smt. Narsamma Hirayya Shaikshanik Trust, Amravati.

Dr. Milind A. Barhate
Vice-Chancellor

Sant Gadge Baba Amravati University,
Amravati - 444 602, Maharashtra (India)

No. SGBAU/P-100/-/2025 Date: 03/03/2025

MESSAGE

It is with great pleasure and appreciation that I extend my greetings to Association of Chemistry Teachers, Mumbai (ACT) and Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati, for organizing the "International Conference on Innovations in Science for Sustainable Development (ICISSD-2025), a commendable initiative that fosters academic excellence, intellectual engagement, and knowledge dissemination.

Conferences such as this play a vital role in bringing together scholars, researchers, and students, providing a platform for meaningful discussions, innovative ideas, and collaborative learning. The meticulous planning, dedication, and commitment demonstrated by the organizing committee and the entire college fraternity in hosting this conference are truly commendable. I am confident that this event will serve as a catalyst for ground-breaking research and insightful dialogue, further enhancing the academic reputation of Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. The participation of distinguished speakers, experts, and students will undoubtedly contribute to a vibrant exchange of ideas, fostering a culture of inquiry and excellence.

I appeal to continue striving for excellence in all your future endeavours. Wishing the conference great success and looking forward to witnessing the positive impact it will have on the academic community.

(Dr. Milind A. Barhate)

To,
Dr. Rajesh S. Chandanpat,
Principal,
Smt. Narsamma Arts, Commerce and
Science College,
Kiran Nagar, Amravati.

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PROF. MAHENDRA P. DHORE
M.Sc. M.Phil. Ph.D. (Computer Science)
Pro-Vice Chancellor

SANT GADGE BABA
AMRAVATI ANIVERSITY,
AMRAVATI - 444 602,
MAHARASHTRA (INDIA)

No.: SGBAU/PVC/ 81 /2025
Date: 10/03/2025

MESSAGE

It gives me immense pleasure to extend my heartfelt congratulations to the entire team of Smt. Narsamma Hirayya Shaikshanik Trust's Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati for organizing the International Conference on Innovations in Science for Sustainable Development on 19-20 March, 2025. This prestigious event stands as a testament to the institution's commitment to fostering research, innovation, and collaboration for a sustainable future.

In the face of global challenges such as climate change, resource depletion, and environmental degradation, scientific advancements play a crucial role in shaping sustainable solutions. This conference serves as a vital platform for scholars, researchers, and industry experts to exchange knowledge, share pioneering ideas, and explore innovative technologies that contribute to the well-being of our planet.

I appreciate the dedication and hard work of the organizing committee, faculty members, students, and participants who have contributed to making this event a grand success. Your efforts in bringing together brilliant minds from across the world will undoubtedly inspire transformative ideas and solutions that benefit society at large.

As we move forward, I encourage all attendees to leverage the insights gained from this conference to drive impactful research and sustainable development initiatives. Let us continue to push the boundaries of scientific inquiry and innovation for a better and more sustainable tomorrow.

Wishing you all a fruitful and enriching conference.

Mdhore 10-3-25

(Prof. Mahendra Dhore)
Pro-Vice Chancellor
S.G.B.Amravati University.

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ASSOCIATION OF CHEMISTRY TEACHERS (ACT)

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Promoting Excellence in Chemistry Education

MESSAGE

I am very glad to learn that Smt.Narsamma Arts ,Commerce and Science College,Amravati is organizing an International Conference on Innovations in Science for Sustainable Development on March 19-20,2025.Association of Chemistry Teachers (ACT),the national registered organization of Chemistry educators of India is proud to be associated with the international event.

During the past few decades, there has been a debate between economic developments versus conservation of the environment. Today, there is a broad consensus that there should be a balance between the two if humanity is to survive and prosper. Sustainable development is today the buzz word all over the world.Hence such conferences are the need of the hour to highlight the innovative scientific developments that contribute to sustainable development.

The conference will serve as a platform for academics, researchers and students to deliberate on the different aspects of sustainable development, climate change, environmental degradation,Green Chemistry and related issues.I offer my best wishes for the grand success of the conference and congratulate the organizers for their dedicated efforts.

Dr D V Prabhu
FRSC (London,UK)
President, Association of Chemistry Teachers
Former Head and Adjunct Professor,Department of Chemistry,
Wilson College (affiliated to University of Mumbai),Mumbai
Former Dean,Faculty of Science,University of Mumbai,Mumbai
Contact No 9870226899

Principal's Message

To,

All Esteemed Participants,

It is with immense pleasure and great honour that I extend my warmest greetings to all participants, distinguished guests, keynote speakers, researchers, and academicians attending the International Conference on Innovations in Science for Sustainable Development. On behalf of Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati, I welcome you to this momentous event dedicated to fostering knowledge exchange, collaboration, and cutting-edge research.

The theme of this conference, Innovations in Science for Sustainable Development, resonates deeply with the pressing global challenges we face today. Science and technology play a pivotal role in shaping a sustainable future, addressing environmental concerns, and improving the quality of life for generations to come. As an academic institution committed to excellence and progress, we take pride in hosting a platform where scholars and experts can share pioneering ideas, inspire change, and contribute meaningfully to global sustainability goals.

We are privileged to have a remarkable line-up of speakers, insightful panel discussions, and ground-breaking research presentations. This conference is not only an opportunity to showcase academic and scientific excellence but also a call to work collectively in finding innovative solutions to real-world sustainability challenges.

I extend my heartfelt gratitude to the Association of Chemistry Teachers, Mumbai (ACT), organizing committee, sponsors, and all contributors who have worked tirelessly to make this event a reality. Your dedication and hard work are truly commendable. To all attendees, I encourage you to actively participate, engage in thought-provoking discussions, and seize this occasion to build meaningful collaborations.

Once again, welcome to the International Conference on Innovations in Science for Sustainable Development. May this event be an enriching experience for all and a catalyst for transformative change in our recreation of sustainability? Wishing you a successful and inspiring conference!

Dr. Rajesh S. Chandanpat
Principal
Smt. Narsamma Arts, Commerce and Science College,
Kiran Nagar, Amravati. India- 444606

Message from the IQAC Coordinator

It is with great pleasure and a deep sense of responsibility that I extend my warm greetings to all distinguished guests, keynote speakers, researchers, academicians, and participants of the *International Conference on Innovations in Science for Sustainable Development*. This conference serves as a crucial platform for intellectual exchange, fostering innovative ideas and solutions that address global challenges while promoting sustainability.

At the *Internal Quality Assurance Cell (IQAC)*, we are committed to upholding academic excellence and fostering research-driven initiatives that contribute to society. This conference aligns perfectly with our mission to encourage interdisciplinary collaboration and knowledge-sharing, ensuring that scientific advancements are not only innovative but also sustainable and impactful. I am confident that the insightful discussions, research presentations, and knowledge dissemination at this event will inspire new perspectives and lead to actionable solutions for a sustainable future. I extend my sincere gratitude to the organizers, esteemed speakers, and all participants for their valuable contributions. Let us work together towards a future where science and sustainability go hand in hand for the betterment of humanity and our planet.

Wishing you all a successful and enriching conference!

Dr. C. H. Sawarkar
IQAC Coordinator
Smt. Narsamma Arts, Commerce and Science College,
Kiran Nagar, Amravati.

Convenor's Message

It is with great enthusiasm and privilege that I welcome you to the *International Conference on Innovations in Science for Sustainable Development*. This conference serves as a dynamic platform for researchers, academicians, industry professionals, and policymakers to engage in meaningful discussions on cutting-edge scientific advancements that contribute to a sustainable future.

As the world faces unprecedented environmental and societal challenges, the role of science and technology in driving sustainable solutions has never been more critical. This conference aims to foster collaboration and knowledge exchange across disciplines, encouraging innovative approaches that address global sustainability concerns.

We have curated a diverse program featuring keynote addresses, technical sessions, and panel discussions led by esteemed experts. The conference will showcase groundbreaking research, pioneering technologies, and forward-thinking strategies aimed at creating a more resilient and sustainable world.

I extend my sincere gratitude to all participants, speakers, organizing committee members, and sponsors for their invaluable contributions in making this event a success. Your insights and expertise will undoubtedly inspire new pathways toward sustainable progress. We are looking forward to your active participation and meaningful discussions.

Dr.Atish K. Maldhure
Convenor
ICISSD-2025

Message from the Organizing Secretary

Dear Participants,

On behalf of the organizing committee, it is my great pleasure to welcome you to the International Conference on Information Systems and Sustainable Development (ICISSD2025). We are honored to host this conference and excited to bring together scholars, researchers, practitioners, and industry leaders from around the world to explore the intersection of information systems and sustainability.

This conference provides a platform for exchanging innovative ideas, presenting cutting-edge research, and fostering collaboration to address the global challenges of sustainable development. The diverse range of presentations and discussions you will encounter here will contribute significantly to the ongoing dialogue on how we can leverage technology to create more sustainable and equitable solutions for the future.

We are proud to present this abstract book, which showcases the breadth of knowledge and research that will be shared during the conference. The papers and topics presented reflect the critical importance of advancing both information systems and sustainable practices, which are vital to achieving a balanced and thriving world.

We would like to thank all the authors, participants, and contributors for their invaluable support and dedication to making ICISSD2025 a success. Your commitment to knowledge and collaboration is what makes this conference truly impactful.

We hope you find the conference informative, inspiring, and a catalyst for new connections and opportunities.

Thank you once again for your participation, and we look forward to a fruitful and engaging experience at ICISSD2025

Dr. Mahendrasingh J. Pawar
Organizing Secretory,
ICISSD-2025

Head, Department of Industrial Chemistry Message

On behalf of the Department of Industrial Chemistry, I am delighted to welcome you to the International Conference on "Innovations in Science for Sustainable Development"

As we stand at the forefront of a new era of Scientific Discovery and Innovation, this conference represents a unique opportunity for us to come together and explore the latest advances in science and technology that can drive sustainable development.

This conference promises to be a landmark event, bringing together renowned experts, researchers, and scholars from around the world to share their cutting-edge research, innovative ideas, and best practices in the fields of science and sustainable development.As we gather to explore the latest advances and challenges in these fields, I am confident that this conference will provide a valuable platform for researchers, policymakers, and industry leaders to share knowledge, ideas, and best practices.

The Department of Industrial Chemistry is committed to fostering a culture of innovation, excellence, and sustainability, and we believe that this conference will be an important step towards achieving these goals.

I would like to extend my sincerest gratitude to all the Stake holders, organizers, sponsors, and participants who have made this conference possible.

I look forward to welcoming you to this exciting event and exploring the many innovations and opportunities that will be showcased.

Prof. Dr. Umesh S. Khandekar
(B.O.S. Chemistry Member)
Head, Department of Industrial Chemistry

Head of Department (Chemistry) Message

It is with great pleasure and enthusiasm that I welcome you all to the **International Conference on Innovations in Science for Sustainable Development**. This conference serves as a pivotal platform for researchers, academicians, industry, experts and policymakers to exchange knowledgeexploreground-breaking innovations, and foster collaborations that drive sustainable development.

Science and technology play a fundamental role in addressing global challenges such as climate change, resource management, and sustainable energy solutions. Through this conference, we aim to highlight cutting-edge research and transformative ideas that will contribute to building a more resilient and sustainable future.

I extend my heartfelt gratitude to our esteemed speakers, participants, and organizing committee for their dedication and efforts in making this event a success. Your contributions and insights will undoubtedly inspire new pathways for scientific advancements that align with sustainability goals.

Wishing you all an engaging and fruitful conference!

Dr. Shrikant B. Bansod
Head of Department
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Smt. Narsamma Arts, Commerce and Science College,
Kiran Nagar, Amravati

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SYNTHESIS, CHARACTERIZATION, THERMAL ANALYSIS AND ION EXCHANGE STUDIES OF NEWLY SYNTHESIZED 4-HYDROXYBENZOPHENONE-GAUNIDINE-FORMALDEHYDE (4-HBPGF-I) COPOLYMER RESIN

Rahul Thengane[1], Jyotsna V. Khobragade[*], W. B. Gurnule[3]
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Abstract

A novel polymer is obtained by condensation of 4-Hydroxybenzophenone, Gaunidine and Formaldehyde in 1:1:2 molar ratio in the presence of acetic acid as a catalyst. The newly synthesized terpolymer have been characterized by different spectral technique like UV-visible, FTIR, NMR and XRD. The surface analysis of this copolymer was determined by Scanning electron microscopy (SEM). The average molecular weight was determined with the help of non-aqueous conductometric titration. Thermal studies of copolymer were carried out to determine their mode of decomposition, the activation energy (E_a), order of reaction (n), frequency factor (Z), entropy change (ΔS), free energy change (ΔF), and apparent entropy change (S^*). For calculating thermal stability and activation energy of this resin two method have been used these are the Freeman-Carroll and Sharp-Wentworth. Ion exchange studies for Cu^{2+}, Ni^{2+}, Co^{2+}, Zn^{2+} and Pb^{2+} ions from strong chelate with the anions of the chloride, perchlorate and sulphates ions electrolytes hence the ion uptake of 4-HBPGF-I copolymer under the influence of chloride, perchlorate and sulphates ions is found lower for all the metal ions. The metal ion Ni^{2+} and Cu^{2+}, ions required maximum 6 hours for the establishment of equilibrium where as Pb^{2+}, Co^{2+} and Zn^{2+} ions required 5 hours for the establishment of equilibrium. On the basis of experimental results, it is revealed that the rate of metal-ion uptake followed the order of $Pb^{2+} > Co^{2+} > Zn^{2+} > Ni^{2+} > Cu^{2+}$.

Keywords*: Synthesis, Condensation, characterization, Surface analysis, Thermal Analysis, ion exchange.*

ULTRASONIC STUDIES OF INTERMOLECULAR INTERACTIONS IN BINARY LIQUID MIXTURES OF LIQUID PETROLEUM PRODUCTS

K.P. Belsare, N.B. Selukar
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Abstract

Molecular interaction studies were conducted on diesel-alcohol mixtures with different percentages of ethanol adulteration. Fundamental physicochemical properties were analyzed, including density and viscosity. Acoustic parameters such as adiabatic compressibility, intermolecular free length, acoustic impedance, relaxation time, and Gibbs free energy were derived from experimental data. The study establishes correlations between physicochemical and acoustic parameters to enable quick adulteration analysis in petroleum products.

Keywords: Diesel, Alcohol, physiochemical parameters, Ultrasonic velocity, acoustic parameters, molecular interaction, correlation studies.

ECO-FRIENDLY SYNTHESIS OF 4,6-DIMETHYL-2-THIO-1,3-DIAZINE

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Abstract

Recently in this laboratory, a direct, suitable and simple method for the synthesis of 4,6-Dimethyl-2-thio-1,3-diazine (3a). A novel 4,6-Dimethyl-2-thio-1,3-diazine (3a) was synthesized by the interacting thiocarbamide (1a) with Acetylacetone (2a) in ethanol medium on water bath. The reaction mixture was filtered in hot conditions, after distillation of excess solvent, faint orange coloured crystals were obtained, recrystalized from ethanol. The structure of the synthesized compounds was justified on the basis of chemical characteristics, elemental and spectral analysis.

Keywords: *Thiocarbamide, acetylacetone, acetone, ethanol, etc.*

MOLECULAR DOCKING TECHNIQUE FOR STRUCTURAL INTERACTIONS IN CHEMICAL MOLECULES

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Abstract

The first Molecular docking algorithm was described in 1982 by Kuntz et al. and it has since the central idea in virtual screening structure-based. Molecular docking is an established in structure-based method widely used in drug discovery. Docking enables the identification of therapeutic interest of compounds and predicting ligand-target interactions at a molecular level or delineating structure-activity relationships (SAR), without knowing a priori the chemical structure of other target modulators. It was originally developed to help understanding the mechanisms of molecular recognition between small and large molecules, uses and applications of docking in drug discovery. It is Computational docking is applied to structure-based drug design and binding for small molecule ligands to macromolecular targets. Molecular docking is widely used for the study of bio-molecular interactions and mechanisms. Molecular docking is the binding between two or more molecules studies using the Auto Dock Tools (ADT) version 1.5.6 and Auto Dock version 2 docking programs to produce a stable complex. Uses and applications of docking, including prediction of adverse effects, polypharmacology, drug repurposing, and target fishing and profiling uses Biomedicine & Pharmacotherapy. Molecular docking this technique is multi-molecular assemblies.

Keywords: Molecular Docking, Molecular interactions, Binding energy, Auto Dock Tools (ADT).

Acknowledgment: author thanks Principal, Research Center, Department of Chemistry, G. M. D. Arts, B. W. Commerce and Science College, Sinnar for providing research laboratory and infrastructure facilities, Molecular docking software.

"The concept of "Paramanu" (atom) as an indivisible, indestructible particle, forming the basis of all matter, and existing in states of both absolute rest and motion".

- Maharshi Kanad

SYNTHESIS, CHARACTERIZATION, THERMAL AND PHOTOLUMINESCENT STUDIES OF NEWLY SYNTHESIZED METAL COMPLEXES SULPHANLIC ACID-THIOUREA-FORMALDEHYDE Cu(II), -Ni(II)

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Abstract

The copolymer have been synthesized by the condensation of sulphanilic acid (SA), thiourea (T) with formaldehyde (F) using 2M HCl as a catalyst in a 1:1:2 ratio of monomers. By using this terpolymer as ligand synthesized metal complexes with two transition metal ions Cu(II) and Ni(II) in 2:1 molar ratio. The reaction conducted for 3hrs with an efficient reflux maintained at 60 °C temp. The synthesized metal complexes have been characterized using UV-Visible spectroscopy, NMR, FTIR, SEM and XRD. Elemental composition of SATF-I-M copolymeric metal complexes were analyzed by elemental analysis method. Thermogravimetric analysis (TGA) was utilized to evaluate the thermal stability of the terpolymer ligand metal complexes, with the activation energy determined using the Freeman-Carroll and Sharp-Wentworth methods based on TGA data. The photoluminescence properties of the newly synthesized copolymer metal complexes were analyzed using the RF-501 (PC) S CE (LVD) MODEL PL spectrometer, which measured the spectra of complexes containing the two transition metal ions. The primary objective of this study is to develop novel polymeric metal complexes and explore their photoluminescent properties, while also acknowledging the valuable contributions of active researchers in the field.

Keywords: terpolymer, metal complex, characterization, thermal degradation, morphology, photoluminescence.

PHYSICOCHEMICAL PARAMETER OF SOIL FROM SOME FARMS OF GHATANJI REGION

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Abstract:

Soil is an important component and essential need to making a food in human life. Thus physico-chemical study of territory is very significant because both physical and chemical properties which bear upon the soil productivity. The quality of soil and availability of water are essential factor for the good yield of the crop. Hence it is necessary to analyze some quality parameters of the soil to determine the quality of soil. The present work has been carried out to study some parameters of soil samples collected from Ghatanji Taluka region District Yavatmal. The soil characterization was carried out for the parameters like pH, Conductivity, TDS, organic carbon, available nitrate nitrogen, calcium and magnesium. The variation of values observed in the different parameters of soil quality in different places.

Keywords: Parameters, Conductivity, TDS, Organic carbon.

SYNTHESIS, CHARACTERIZATION, KINETIC AND ION EXCHANGE STUDY OF NOVEL COPOLYMER RESIN 4-HYDROXYBENZOPHENONE-GAUNIDINE-FORMALDEHYDE-II 4-*(HBPGF-II)*

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Abstract

A newly copolymer is synthesized by condensation of three monomers 4-Hydroxybenzophenone, Gaunidine and Formaldehyde in 2:1:3 molar ratio in the presence of acetic acid as a catalyst. The structure of terpolymer has been elucidate by different physico-chemical technique. For example, Spectral technique- UV-visible, FT-IR, H^1-NMR, XRD and non-aqueous conductometric titration, elemental analysis. The surface analysis is studied with the help of Scanning electron microscopy (SEM). The warm deterioration example and its energy were examined by thermo gravimetric examination (TGA) in a static nitrogen environment at a warming rate of 10°C/min. The SW and FC methods have been embraced to assess the activation energy and thermodynamics parameters, for example, the activation energy (Ea), order of the reaction (n), entropy change (ΔS), Free energy change (ΔF), entropy change (S*) and frequency factor (Z). The copolymer resin has showed to be a discerning chelate ion alternate resin for a few metals. Ion exchange properties of this resin were experimented for the metals as copper, cobalt, nitrate, zinc and lead in exclusive with electrolyte concentrations, time durations and wide pH variety become delivered out by means of batch equilibrium method. The above resin shown higher selectivity for copper and nickel metals ions than for cobalt, zinc and lead metal ions. The measurement of distribution as a pH character determines amount of metals absorption by copolymer increases with increasing pH.

Keywords: Synthesis, Condensation, characterization, surface analysis, Kinetic study,

STUDY OF SYNTHESIS AND CATALYTIC APPLICATIONS OF CHROMIUM (VI)COMPLEXES OF MALONIC ACID

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Abstract:

This paper explores the oxidation of malonic acid using Ditertiary Butyl Chromate (DTBC), a Chromium(VI)-based oxidant. The reaction was carried out with various molar ratios of Malonic acid to oxidant, resulting in the formation of different solid products, which were then isolated, purified, and analyzed. The structure and composition of these products were determined using elemental analysis, FTIR spectra, and Thermogravimetric analysis (DTA-TGA). The oxidized products are Chromium(VI) complexes, which are later used as catalysts in various organic reactions. The study focuses on understanding whether the chromium in its reduced state forms complexes with the oxidized fragments or unreacted substrate.

Keywords: Chromium (VI) complexes, Malonic acid, Oxidation, Organic synthesis.

GREEN SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY OF SILVER NANOPARTICLES USING MOMORDICA CHARANTIA LEAF EXTRACTS

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Abstract:

The development of nanotechnology interests the researchers for synthesis of nanoparticles with various bio-applications. The green synthesis of Silver nanoparticles (AgNPs) were prepared through green route with the aid of Momordica charantia leaf extract as both reductant and stabilizer. X-ray diffraction pattern (XRD) and selected area electron diffraction (SAED) fringes revealed the structure of AgNPs as face centered cubic (fcc). Morphological studies elucidate the nearly spherical AgNPs formation with particle size in nanoscale. Biosynthesized AgNPs were found to be photoluminescent and UV-Vis absorption spectra showed one surface plasmon resonance peak (SPR) at 424 nm attesting the spherical nanoparticles formation. XPS study provides the surface chemical nature and oxidation state of the synthesized nanoparticles. FTIR spectra ascertain the reduction and capping nature of phytoconstituents of leaf extract in AgNPs synthesis. Further, these AgNPs showed effective antimicrobial activity against tested pathogens and thus applicable as potent antimicrobial agent. In addition, the synthesized AgNPs were observed to have an excellent catalytic activity on the reduction of methylene blue by M. Charantia which was confirmed by the decrement in maximum absorbance values of methylene blue with respect to time and is ascribed to electron relay effect. The Antimicrobial activity of the AgNps was established using disc diffusion and agar well diffusion method. The assay showed that AgNps can be a potent antimicrobial agent against S*taphylococcus aureus*, *Pseudomonas aerogenosa* and *Escherichia coli* with inhibition against *Aspergillus flavus*.

***Keywords*:** Green Synthesis, Silver nanoparticles, Momordica Charantia Leaf, Antimicrobial Activity.

SYNTHESIS, CHARACTERIZATION AND STRUCTURAL STUDY OF SUBSTITUTED 4,4'- DIMETHOXYLBENZOINSPHENYLHYDRAZONE

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Abstract

Recently, the synthesis o 4,4'- Dimethoxylbenzoinsphenylhydrazone, oxime, hydrazone, and semicarbazone were synthesized by the interactions of 4,4'- Dimethoxylbenzoins with hydroxylamine hydrochloride, hydrazine hydrate, phenyl hydrazine and semicarbazide hydrochloride in presence of aqueous sodium hydroxide in DMF-water (80%) medium respectively. 4,4'- Dimethoxylbenzoin, were carried out by the known literature method. The structure of all the synthesized compounds were justified on the basis of chemical characteristics, elemental and I.R. and NMR spectral analysis.

***Keywords*:** Sodium hydroxide, DMF-water (80%) medium, substituted, phenyl hydrazine, 4,4'- Dimethoxylbenzoinsphenylhydrazone.

DESIGN AND DEVELOPMENT OF IOT BASED AUTOMATIC IRRIGATION SYSTEM USING ARDUINO UNO

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Abstract

The research paper deals with IOT based automatic irrigation system using Arduino UNO. In this research work we have designed a system which is going to measure various parameters of environment such as temperature, detect the presence of rain, soil moisture and humidity. Here Arduino Uno is used to control the entire system of sensor such as Temperature sensor, Rain sensor, Soil moisture sensor, Humidity Sensor, relays, fan, water pump and liquid crystal display. All the four sensors plays vital role in operating the fan and water pump. There are various conditions in which the fan and water pump turns ON or OFF. In the present system we have also interfaced liquid crystal display with the Arduino Uno. The LCD displays environment temperature, status of rain, soil moisture in percentage, humidity in percentage, and state of fan and water motor whether they are ON or OFF. The purpose of designing such type of system is to automatically monitor the irrigation system, one can see the various parameters on single screen. The advantage of such system is that, we know the status of fan and water motor whether they are ON or OFF just from the LCD screen display. The fan and water motor is automatically turned ON or OFF according to predefined values of sensors so no human intervention is required.

Keyword- Arduino Uno, Temperature Sensor, Rain Sensor, Soil Moisture sensor.

NATURAL SYNTHESIS OF SUPERHYDROPHOBIC STAINLESS STEEL MESH FOR OIL-WATER SEPARATION

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Abstract

The objective of this review is to highlight recent advances in the application of SiO_2-based polymer nanocomposite surfaces for oily wastewater treatment. There is a need to develop methods and materials that show excellent ability to separate the oil and organic contaminants from water. The superhydrophobic coated sponges and metal meshes are used to separate oil from the oil-water mixture. The various surface-modified organic metal oxide nanoparticles are used to develop superhydrophobic surfaces on porous substrates. Metal-oxide-based nanomaterials, including SiO_2, TiO_2, ZnO, etc. have gained tremendous attention due to their unique mechanical and chemical properties such as micro-hierarchical, hydrophobic, stability, and wettability. Among them, SiO_2 nanoparticles are mostly useful for the preparation of superhydrophobic surfaces. The current challenges for the successful development of SiO2-based nanocomposite surfaces and opportunities for future research are also discussed. This review focused on silica-modified porous sponge and metal meshes for scalable oil-water separation applications.

Keywords: Metal Mesh, Oil-Water Separation, Porous Sponge,

FABRICATION OF AMINE FUNCTIONALISED GRAPHENE OXIDE AND ITS EFFICACY AS RECOVERY OF TOXIC METAL IONS FROM WASTE WATER

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Abstract

The present study explores the preparation and characterization of chemically grafted amine functionalized Graphene Oxide (GO). Initially, Graphene oxide is synthesized from graphene according to Hummer's method. The expanded interlayer structure of graphene oxide can be easily exfoliated by using ultrasonication. Amine functionalized graphene oxide has been prepared by chemical grafting of different amines onto graphene oxide through two step reaction with the aid of thionyl chloride. The newly synthesized product was analyzed using various spectroscopic techniques, including UV-Visible, FT-IR, ^{1}H-NMR, XRD, SEM, TEM and thermogravimetric analysis (TGA). Spectroscopic studies confirm the successful functionalization of amines onto graphene oxide (GO-NH_2). The GO-NH_2 with high surface area and numerous active sites can efficiently adsorb Cr(VI), Hg(II), Pb(II) and Cd(II) ions. The batch equilibrium study was carried out over a wide pH range, shaking time and in media of various ionic strengths of different electrolytes. The characteristics of Cr(VI), Hg(II), Pb(II) and Cd(II) in the GO-NH_2 adsorption processes were analyzed using the Langmuir and Freundlich isotherm models. This study provides an effective pathway to process industrial wastewater and the GO-NH_2 has a good adsorption effect for the treatment of heavy metals in industrial wastewater.

***Keywords*:** Graphene oxide, Exfoliation, Heavy metal, FT-IR Spectroscopy, XRD.

USING ENVIRONMENTALLY FRIENDLY ZINC OXIDE NANOPARTICLES, SELECTIVE HEAVY METAL IONS CAN BE REMOVED FROM AQUEOUS SOLUTIONS

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Abstract

This study synthesizes zinc oxide nanoparticles (ZnO NPs) from Nyctanthus arbor-tristis flowers in a non-toxic, safe, and environmentally friendly manner. The adsorption of U(VI), Pb(II), Cr(VI) and Cd(II) ions from aqueous solutions by Nyctanthus arbor-tristis flower extract was investigated under laboratory conditions to assess its potential in removing these metal ions. The impacts of the experimental factors, such as ZnO NPs dosage, solution pH and contact time, were optimized. According to our study, under ambient settings, the bulk of the harmful metal ions can be adsorbed from the solution in a comparatively short amount of time. The adsorption behaviour of toxic metal ions onto the ZnO NPs was analyzed with Freundlich as well as Langmuir rate equations and the results were supported by the pseudo-second-order kinetic models. The study provides a safe, non-toxic and eco-friendly green synthesis method and also demonstrated excellent performance of the synthesized ZnO NPs.

Keywords: Adsorption, ZnO Nanoparticles, Nyctanthus arbor-tristis, Langmuir isotherm

STATISTICAL ANALYSIS OF ENVIRONMENTAL PARAMETERS IN CHENGALPATTU, TAMIL NADU: A STUDY ON AIR QUALITY, WATER QUALITY, AND LAND USE PATTERNS

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Abstract

Chengalpattu, a rapidly urbanizing region in Tamil Nadu, faces significant environmental challenges due to industrialization, population growth, and unplanned urbanization. This study aims to analyze key environmental parameters, including air quality, water quality, and land use patterns, using statistical methods such as descriptive statistics, correlation, and regression analysis. Data were collected from various monitoring stations and satellite imagery over a five-year period (2018–2023) to assess trends and relationships among environmental variables. Descriptive statistics revealed that particulate matter (PM2.5 and PM10) levels consistently exceeded WHO guidelines, while water quality parameters such as pH, dissolved oxygen (DO), and biochemical oxygen demand (BOD) indicated moderate to severe pollution in local water bodies. Land use analysis showed a 15% increase in built-up areas at the expense of agricultural and forested lands. Correlation analysis highlighted a strong positive relationship between urbanization and air pollution ($r = 0.78$, $p < 0.01$), as well as a negative correlation between vegetation cover and surface water contamination ($r = -0.65$, $p < 0.05$). Regression models predicted a 20% increase in air pollution levels by 2030 if current trends persist. The findings underscore the urgent need for sustainable urban planning and stricter environmental regulations in Chengalpattu. This study provides a data-driven framework for policymakers to address environmental degradation and promote ecological balance in the region.

Keywords**:** Chengalpattu, environmental degradation, air quality, water quality.

SUSTAINABLE TRANSPARENT AND BIO-BASED FLAME-RETARDANT COATING FOR COTTON FABRICS BASED ON PHOSPHORUS MODIFIED CHITOSAN BPS COMPOSITE

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Abstract:

Technological advancements and improved manufacturing capacities have rendered synthetic and natural polymers indispensable in a variety of industries, including housing, furniture, and industrial applications. However, the widespread use of synthetic materials, notably plastics and textiles, has increased worries about fire safety. This global perspective on fire-related deaths emphasizes the critical need for adequate fire prevention and safety precautions. Researchers have proposed two solutions to solve these needs: installing improved fire alarm systems and using flame-retardant technologies. Fire alarm sensors are designed to identify fire risks immediately, although conventional smoke and infrared detectors have limitations, resulting in delayed alert signals due to existing fire alarm mechanisms. These methods prevent flammable volatiles from reaching flames, so safeguarding combustible materials from heat and oxygen.

Bio-based flame retardants are in high demand due to the increased emphasis

on eco-friendly flame-retardant finishing of cotton fabrics (CF). The eco-friendly natural product phosphorus-modified chitosan banana-pseudo stem sap (P-CBPS) composites were used to give flame retardancy in cellulosic cotton fabrics. The collected banana pseudo stem sap was treated with phosphorus and chitosan before being applied to cotton fabrics. In terms of LOI and VFT, the flame-retardant qualities of both the control and treated cloths were evaluated. P-CBPS-treated fabrics were shown to have good flame-retardant qualities, with a LOI of 48 compared to the control fabric's LOI of 18, a 2.7-fold increase. The P-CBPS-treated fabric displayed a flame for a few seconds before being extinguished in the vertical flammability test. A safer, bio-based fire-retardant material that is cost-effective, environmentally friendly, non-hazardous, and highly efficient for advanced fire-resistant applications.

PREPARATION OF MALEINIZED COCONUT-LINSEED OIL (MCLO) BY CONVENTIONAL METHOD AND IT'S APPLICATION IN THE FORMULATION OF LIQUID DETERGENT

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Abstract

Coconut-linseed oil has found wide application in the coatings, cosmetics & detergents. India is the largest exporter of coconut-linseed oil in the world.35-55% of the seed content is a valuable drying oil with many industrial applications. In the present study, modification of coconut-linseed oil through the malenization of coconut-linseed oil carried out with the use of maleic anhydride to form malenized coconut-linseed oil. In this method of addition of unsaturation compound to the unsaturated part of the oil molecule, thus increasing its complexity and heat reactivity. The product obtained from maleic addition is known as the adduct which when neutralized with inorganic alkali, ammonia gives water miscible oils. Their solubilized oils may be used for different applications like cosmetics, detergents etc. The application of malenized coconut-linseed oil has been done in the formulation of liquid detergent Liquid detergents prepared by this resin with acid slurry in different proportions are giving excellent results in comparison with that of commercial products. This research was undertaken to develop products which are based on naturally available raw materials specifically not of petroleum origin. This is an attempt to make the novel products useful for society and to reduce percentage of non-renewable product usage in day to day life thus solving problem of environmental pollution to some extent and thus favor eco-friendly products technology.

***Keywords*:** Coconut-linseed oil; Malenized Coconut-linseed oil; Liquid Detergents.

INVESTIGATING THE THERMAL PROPERTIES OF THE 8-HYDROXYQUINOLINE-ACRYLAMIDE-FORMALDEHYDE COPOLYMER

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Abstract

8-hydroxyquinoline, acrylamide, and formaldehyde were polycondensed in a 2:1:3 molar ratio using 2M HCl as a catalyst under reflux in an oil bath for five hours

at 122°C to create the 8-HQAF copolymer. Gel permeation chromatography was used for determining the number-average molecular weight, while elemental analysis was used to determine the copolymer composition. FTIR, ^{1}H NMR, and UV-visible spectroscopy were employed to further analyze the copolymer and reveal its structure. Its crystalline nature was discovered by morphological investigations using XRD and scanning electron microscopy. Thermogravimetric analysis was used to investigate the copolymer's decomposition pattern and kinetics at a heating rate of 20°C/min in a static O_2 environment. Kinetic and thermodynamic characteristics, including thermal activation energies, order of reaction, entropy change, free energy change, apparent entropy, and frequency factor, have been measured using Freeman–Carroll and Sharp–Wentworth methodologies. It is determined that the order of reaction is 0.98.

***Keywords*: -** Copolymer, Morphology, Thermal analysis, Spectral, Activation energy.

A COMPARATIVE STUDY ON DECOMPOSITION RATES AND ENVIRONMENTAL IMPACTS OF SAL LEAVES VS. COMMON LEAF LITTER AND CHALLENGES TO CONVERT IT INTO COMPOST

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Abstract:

This study investigates the decomposition rates of sal (Shorea robusta) leaves compared to other common leaf litter, such as oak (Quercus spp.), pine (Pinus spp.), and maple (Acer spp.) leaves and other leaves. Leaf litter decomposition is a crucial process in nutrient cycling and soil health, influencing forest ecosystem productivity and carbon sequestration. The research involved studies consisting of field and laboratory experiments to measure the mass loss and nutrient release over time under controlled conditions. The results indicated that sal leaves decompose at a significantly slower rate compared to the other leaf types, attributed to their higher lignin content and tougher physical structure. The study also highlighted the role of microbial communities and environmental factors such as temperature and moisture in the decomposition process. Understanding these differences provides insights into forest management practices, especially in tropical regions like Chhattisgarh where Sal trees are prevalent, and underscores the importance of species-specific strategies for enhancing soil fertility and carbon management. Sal (Shorea robusta) leaf litter is a significant biomass resource in forest ecosystems, yet its conversion into compost presents several challenges. The high lignin and polyphenol content in sal leaves slows decomposition, making conventional composting methods inefficient. Additionally, the seasonal abundance of sal leaf litter leads to difficulties in collection, storage, and management. The lack of microbial diversity capable of degrading recalcitrant compounds further hinders composting efficiency. Moreover, issues such as inadequate nitrogen balance, prolonged composting time, and limited awareness among local communities affect large-scale adoption. This study explores these challenges and discusses potential strategies, including microbial inoculation, co-composting with nitrogen-rich materials, and optimized composting conditions to enhance the decomposition of sal leaves. Addressing these barriers can improve the feasibility of sal leaf composting, contributing to sustainable waste management and soil fertility enhancement.

***Keywords* -** Sal leaves, Decomposition, Nutrient cycling, Soil fertility, Management.

A STUDY OF MALNUTRITION AMONG THE TRIBAL CHILDREN OF CHIKHALDARA REGION

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Abstract

Malnutrition is one of the major causes of childhood mortality among under-five-year-old children in the Chikhaldara region. Malnutrition affects the level of serum protein.Serum serves many different functions, including the transport of lipids, hormones, vitamins, and metals in the circulatory system, and regulation of cellular activity & functioning of the immune system. Anthropometry is considered to be an important tool for assessing the nutritional status of individuals. A cross-sectional study was conducted, and serum protein level & BMI were calculated. Serum protein levels observed were lower than the normal standard range in studied area of age group 0-5 years. BMI was calculated based on the ratio of weight (kg) to height (m^2). The study showed that children of this tribal region were underweight. The anthropometric study among tribal children observed a prevalence of lower weight & lower height. Tribal children are lean & thin.BMI had a strong association with nutritional status. A low BMI index was observed, which may be responsible for an anaemic condition and protein-calorie malnutrition in studied area.

Keywords: Tribal, Malnutrition, Serum, Protein, Chikhaldara.

SYNTHESIS, CHARACTERIZATION, AND GAS ADAPTATIONS OVER WO_3 THIN FILMS

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Abstract:

The synthesis of WO3 thin films using a modified sol-gel method is presented in this work. A thorough investigation was conducted into the impact of aging gel aging time and aging temperature on the morphology and sensing capabilities of WO3 thin films. The produced nanomaterials were characterized with respect to their morphology, composition, and crystallography. The morphological analysis was conducted using electron microscopy, and the crystallographic study was conducted using X-ray diffraction. Energy-dispersive X-ray spectroscopy (EDAX) was used in the compositional investigations. Systematic research was done on the reaction to hydrogen at various operating temperatures and gas concentrations.

Keywords: Nano crystalline WO_3 thin films, H_2 Gas sensor.

"***Nagarjuna, a renowned Buddhist philosopher, an Indian metallurgist and Alchemist in his treatise "Rasaratnakara" explored the techniques of extraction of metals such as silver, gold, tin and copper from their ores and their purification were also mentioned in the treatise.***

SYNTHESIS AND CHARACTERIZATION OF N-BENZIMIDAZOLYL SUBSTITUTED PYRAZOLINES

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Abstract

N-Benzimidazolyl substituted Pyrazolines (3a-f) are prepared by reacting 2-hydrazino benzimidazole with 1,3 disubstituted prop-2-ene-1-one (2a-f) in various reaction medium. The synthesized compounds are characterized by IR, NMR
Keywords: IR, NMR, Pyrazolines, N-Benzimidazolyl.

PHYTOCHEMICAL COMPOSITION OF ESSENTIAL OIL OF PLUMERIA ALBA FLOWER BY GC-MS ANALYSIS

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Abstract

Plumeria alba (Family: Apocynaceae), commonly known as temple tree/white frangipani is an ornamental, deciduous, tropical plant grown in landscape places, gardens, parks, and home premises for its beautiful and fragrant flowers. The different parts of white frangipani are traditionally used for the treatment of several diseases. This study was executed to identify the volatile constituents of the flower essential oil of P. alba from India, as this has not been studied to date. The essential oil composition was investigated through GC/MS analysis. The isolation of essential oil through the hydro distillation method. A total of 46 volatile constituents were identified, representing 98.11±0.5 % of the total essential oil. The essential oil was rich in esters comprising 48.61±0.3 % of the essential oil followed by oxygenated monoterpene (15.41±0.1 %), oxygenated sesquiterpene (10.43±0.08 %) and sesquiterpene hydrocarbons (10.39±0.1 %), etc. The dominant components of the essential oil were benzyl salicylate (33.98±0.04 %), benzyl benzoate (12.37±0.03 %), germacrene B (10.30±0.05 %), and linalool (8.17±0.11 %). Other notable constituents identified in the essential oil were (2Z,6Z)-farnesol, n-heneicosane, n-nonadecane, (Z, E)-geranyl linalool, trans-sabinene hydrate acetate, (2E,6Z)-farnesol, α-terpineol, n-docosane, geranyl benzoate, n-tricosane, α-bisabolol, nerol and 8-cedren-13-ol, etc. (1.17 % - 4.76 %).
Keywords - Plumeria alba, Essential oil, Hydro distillation, GC-MS

GREEN SYNTHESIS OF COBALT OXIDE NANOPARTICLES USING MORNINGA LEAF EXTRACT:A SUSTAINABLE APPROACH

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Abstract

The synthesis of metal oxide nanoparticles has gained significant attention due to their diverse applications. However, conventional synthesis methods involve toxic chemicals and high energy consumption. In this study, we report a green synthesis approach for cobalt oxide (CoO) nanoparticles using Moringa leaf extract, which

enhances catalytic properties. The sol-gel method was employed, where 20 g of Moringa leaf extract was treated with a cobalt salt solution under constant stirring for 5 hours. A gel was formed and subjected to a pressure bomb, leading to the formation of green cobalt oxide nanoparticles. The synthesized nanoparticles were characterized using UV-Vis spectroscopy, X-ray diffraction (XRD), and antimicrobial activity analysis. Results confirmed spherical nanoparticles with an average size of 10–15 nm. These eco-friendly nanoparticles have potential applications in catalysis, sensing, biomedical fields, food industries, water purification, and antimicrobial treatments.
Keywords: Green synthesis, CoO nanoparticles, Moringa leaf extract.

A SURFACTANT ASSISTED HYDROTHERMALLY SYNTHESIZED, CHARACTERIZATIONS, AND ELECTROCHEMICAL PERFORMANCE OF ORIGINAL AND NICKEL-DOPED MnO_2 NANOCOMPOSITES FOR SUPERCAPACITOR APPLICATION

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Abstract

In this study, surfactant-assisted hydrothermal synthesis was employed to fabricate both original and Ni-doped MnO_2 nanocomposites with potential applications in supercapacitors. The influence of surfactants on the structural, morphological, and electrochemical properties of the MnO_2 and Ni-doped MnO_2 nanomaterials was thoroughly examined. The materials were characterized using various techniques, including X-ray diffraction, scanning electron microscopy, transmission electron microscopy and electrochemical analysis. The results revealed that the surfactant-assisted synthesis significantly enhanced the structural integrity and surface area of the MnO_2 nanocomposites. Furthermore, nickel doping was found to improve the material & 39s electrical conductivity and charge storage capacity, leading to better electrochemical performance. The electrochemical behavior of the nanocomposites was investigated using cyclic voltammetry, galvanostatic charge-discharge, and electrochemical impedance spectroscopy. Ni-doped MnO_2 nanocomposite demonstrated superior capacitance, high cycling stability, and improved rate capability compared to the pristine MnO_2, making it a promising candidate for high-performance supercapacitor applications. This study highlights the crucial role of surfactants and doping in optimizing the electrochemical properties of MnO_2-based nanomaterials for energy storage devices.
Keywords: Supercapacitor, Manganese Dioxide, XRD.

SYNTHESIS, SPECTROSCOPIC CHARACTERIZATION, THERMAL AND CATALYTIC STUDY OF VO(IV) COMPLEXES INVOLVING TETRADENTATE *ONNO* SCHIFF BASES

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Abstract

Mononuclear oxovanadium (IV) complexes containing tetradentate Schiff base ligands have been synthesized. The Schiff base ligands were obtained by the

condensation of 5-chloro-2-hydroxyacetopheneone or 5-chloro-2-hydroxy-3-nitro-acetophenone with trans-1,2-diamino-cyclohexane. The complexes have been characterized by elemental analysis, IR, electronic, magnetic measurements, ESR, XRD and thermal analysis. The $[VO(L^1)]H_2O$ and $[VO(L^2)]H_2O$ complexes have been examined as catalysts for oxidation of styrene in presence of hydrogen peroxide as oxidants. The thermal properties of both the complexes have been assessed using TG-DTG thermal technique and similar properties were found. In both the complexes, firstly, the coordinated water molecule is lost from the complex; in subsequent steps, ligand leaves the complex in the temperature range 125-730 ^oC. Finally the complexes decompose to the vanadium oxide at higher temperature ranges. IR spectra show that ligands coordinated to the vanadium ion in a bi-negative tetradentate manner with *ONNO* donor sites of the azomethine-*N* and phenoxide-*O*.

TOXIC EFFECTS OF PARTHENIUM HYSTEROPHORUS ON HISTOLOGY OF GILLS OF FRESHWATER FISH LABEO ROHITA

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Abstract

Toxicity study was conducted on freshwater fish Labeo rohita to evaluate the histological effects of Parthenium hysterophorus on gills of Labeo rohita upto 96hrs. duration i.e. 24,48,72 and 96 hrs. which shown toxic effect on gills.

Keywords: Parthenium hysterophorus, Gills Histology, Labeo rohita.

BIO-INFLUENCED SYNTHESIS OF COPPER NANOPARTICLES: STRUCTURAL AND FUNCTIONAL CHARACTERIZATION

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Abstract

Nanotechnology and nanoparticle development have been advancing rapidly in recent years. Copper nanoparticles (Cu NPs) exhibit unique properties such as a high surface to volume ratio, enhanced catalytic activity, excellent light-scattering properties, superior electrical conductivity, biocompatibility, and potential for targeted drug delivery. These remarkable characteristics have made Cu NPs highly valuable in industries, biomedical sciences, and various other sectors. Unlike bulk copper, Cu NPs possess distinct size, shape, and properties, making them a promising alternative to conventional materials. Despite their growing demand, the large-scale production of Cu NPs remains a challenge due to the need for rapid, high-yield, eco-friendly, and cost-effective synthesis methods. Traditional physical and chemical synthesis techniques are often time-consuming, involve toxic chemicals, generate harmful by-products, and are not environmentally sustainable. To address these challenges, we developed a bio inspired method for synthesizing Cu NPs using orange peel (Citrus sinensis), an abundant bio waste material. Orange peel is rich in bioactive molecules that facilitate the reduction of bulk copper to the nanoscale. The structural properties of the synthesized Cu NPs were analysed using various characterization techniques, including UV-visible spectroscopy, X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDS). XRD

analysis confirmed that the Cu NPs had a cubic structure. In the EDS spectrum, copper shows signals at 0.9 keV, 8.2 keV, and 8.9 keV, it confirms the presence of copper and supports the successful synthesis of copper nanoparticles. This study highlights the potential of orange peel as a sustainable and cost-effective reducing agent for the green synthesis of Cu NPs, paving the way for environmentally friendly benign synthesis.

Keywords **-** Nanotechnology, Nanoparticles, Copper nanoparticle, Bio synthesis.

SYNTHESIS, CHARACTERIZATION AND CHELATING ION-EXCHANGE PROPERTIES OF NEWLY FORMED 2,4- DIHYDROXY BENZOIC ACID, BIURET AND FORMALDEHYDE RESIN

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Abstract

A new terpolymer resin was synthesized from 2,4-Dihydroxy Benzoic acid and biuret with formaldehyde by polycondensation method in the presence of 2M HCl as catalyst. The terpolymer resin was characterized by elemental analysis and spectral methods Terpolymer composition has been determined in the basis of their elemental analysis. The terpolymer resin has been characterized by uv visible, I.R. and ^{P}NMR spectra the no. average molecular weight has been determined by conductometric titration in non-aqueous medium. The viscosity measurements were carried out in dimethyl formamide which indicate normal behavior. The ion-exchange properties of newly synthesized terpolymers proved to be selective for certain metals. Chelating ion-exchange properties of the newly synthesized terpolymer have also been studied employing batch equilibrium method. The chelating ion-exchange properties of this terpolymer was studied for Fe (III), Cu (II), Cd (II), Co (II), Zn (II), Ni (II), and Pb (II) ions. The study of this resin carried out over a wide pH range and in media of various ionic strengths. The overall rate of metal uptake by 8-HQAF terpolymer resin follows the order: Fe(III) > Cu(II) ≈ Ni(II) > CO(II) ≈ Zn(II) > Cd(II) ≈ Pb(II)

Keywords: Resins, Ion-exchange, NMR, FT-IR, Degree of polymerization, viscosity.

A STUDY ON PHYSIO-CHEMICAL PROPERTIES OF SOIL SAMPLES FROM DIFFERENT INDUSTRIAL SITES AND FORETHOUGHT ON ITS DISPOSAL METHOD

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Abstract

Soil contamination is a growing as a major threat to sustainable development in industrial areas due to the disposal of industrial waste, effluents, and emissions. Developmental activities prominently affect the fertility of the soil and quality of water and alter its potential for safe use. Samples were collected from different industrial zones near Pithampur, Present study investigates the physio-chemical properties of soil samples collected from various industrial sites assessed for its employability on grounds of its analytical methods such as pH, moisture content, organic matter, heavy metal concentration, and other key indicators. Based on the findings, literature reviewed disposal and remediation methods are also proposed.

Keywords**:** Disposal Method, Turbidity, effluents, pH, Physio- Chemical Properties

BIOTECHNOLOGY FOR ECO-FRIENDLY PEST MANAGEMENT: ORGANIC BIOINSECTICIDES, PLANT-DERIVED BIOPESTICIDES, PHEROMONES, AND REPELLENTS

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Abstract

Rapidly growing world population is constantly putting pressure on agricultural system creating a detrimental impact on environment. The challenges are considerable as more than 40 percentage of the crop productivity is lost due to weeds, attack by pest and pathogens. A nearly limiting physical and biological productivity of different crop varieties is also a case of consideration. This problem can be overcome by using safe and ecofriendly biotechnological products including organic bioinsecticides, plant-derived biopesticides, pheromones and repellents. Harnessing such biotechnology tools for sustainable solutions can be critical, efficient and effective environment-friendly strategies that contribute to long-term environmental and agricultural sustainability.

Keywords: Bioinsecticides; pheromones; repellents; sustainable development, agricultural system

EXPLORING THE ROLE OF VARIOUS FACTORS IN RECURRENT PREGNANCY LOSS: A STUDY IN THE JAIPUR POPULATION

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Abstract

Recurrent pregnancy loss (RPL) is a significant reproductive health issue affecting approximately 1–5% of women worldwide. It is a multifactorial condition influenced by various factors, including autoimmune disorders, genetic predispositions, and uterine abnormalities. A deeper understanding of these contributing elements is crucial for improving diagnostic, preventive, and therapeutic strategies for affected women. This study aims to investigate the role of autoimmune disorders, genetic mutations, and uterine abnormalities in the pathophysiology of RPL among women in Jaipur. The specific objectives include determining the prevalence of these factors in the study population and analyzing their correlation with RPL. A structured questionnaire will be employed to collect demographic details such as age, marital status, education level, socioeconomic status, occupation, and lifestyle factors (e.g., smoking, alcohol consumption, dietary habits, and geographical location). Additionally, comprehensive medical histories will be obtained, including previous pregnancy outcomes and family history of genetic disorders or RPL. To assess potential contributing factors, participants will undergo hormonal assays, genetic testing, immunological assessments, and ultrasound examinations. The study is expected to provide critical insights into the diverse etiological factors of RPL, identifying key contributors such as chromosomal abnormalities, thyroid dysfunction, autoimmune diseases, and uterine anomalies. Also it will explore the effectiveness of various interventions, including lifestyle modifications, hormonal therapy, and

surgical treatments, in addressing the underlying causes of RPL. Overall, this research will enhance the understanding of RPL's multifactorial nature by highlighting the complex interplay of genetic, endocrine, immunological, environmental, and sociodemographic influences on its prevalence in the Jaipur population.

Keywords: Recurrent Pregnancy Loss, Autoimmune Disorders, Genetic Mutations, Uterine Abnormalities, Hormonal Dysfunction, Antiphospholipid antibody.

SYNTHESIS AND BIOLOGICAL ACTIVITY OF NITROGEN-CONTAINING FUSED HETEROCYCLIC COMPOUNDS

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Abstract

This study focuses on the synthesis of nitrogen-containing heterocyclic compounds, particularly five-membered rings like pyrrolidine derivatives, and their significance in biomedical and pharmaceutical applications. Nitrogen heterocycles are vital components of bioactive molecules such as tryptamine, vinblastine, and nicotine, which have important therapeutic roles. The review highlights their potential as intermediates for developing complex drugs like aniracetam and doxapram. Recent advances in synthetic methods, including nanocatalysis, green chemistry, and atom economy, are discussed for improving the efficiency and sustainability of these processes. Additionally, the pharmacological activities of thiazolidine derivatives and the benefits of cleaner synthesis techniques are explored, offering insights into the future of heterocyclic chemistry in drug development.

Keywords: Nitrogen Heterocycles, Tryptamine, Nanocatalysis, Green Chemistry.

MONITORING OF HEAVY METALS CONCENTRATION IN FOUR SITES OF VENA RIVER WATER, HINGANGHAT DIST. WARDHA M.S.

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Abstract:

The current research aimed to monitor the heavy metal concentration in four sites of Vena river water, Hinganghat. In this area textiles, agro industries, pharmaceutical company, cotton mill, Swad Chai company, oil industry, paper mill, dall mill are located. Since these sampling sites received a lot of industrial effluents. Determination of heavy metals concentration was done with Inductively coupled plasma spectrometer. The concentration of heavy metals lead, chromium, cadmium, zinc, ferrous, arsenic, except nickel and copper is higher in site two, three and four due to nearby industries. Hence monitoring of heavy metals is necessary and it is necessary to do proper treatment before removal of industrial effluents in river water.

***Keywords*: -** Concentration, Heavy Metals, Vena River, Industries.

"Science without religion is lame, religion without science is blind"

Albert Einstein

SYNTHESIS AND CHARACTERIZATION OF COPOLYMER DERIVED FROM 2,4-DIHYDROXY ACETOPHENONE AND ADIPAMIDE WITH FORMALDEHYDE

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Abstract:

2,4-Dihydroxy acetophenone, adipamide, formaldehyde copolymer is a novel material with potential applications in various fields including adhesives, coatings, textile finishes, molding compounds, paper impregnation, insulation materials and composites. The synthesis of copolymer involves the condensation polymerization of 2,4-dihydroxy acetophenone, adipamide and formaldehyde in 1:1:2 molar ratios using 2M HCl as catalyst. The copolymer was characterized by FTIR, ^{1}H NMR, ^{13}C NMR, UV-Visible spectra, SEM and TGA are employed to investigate the structural determination, molecular identity, composition, thermal stability of synthesized copolymer. The number average molecular weight of copolymer was determined by GPC method. Viscosity measurement were carried out in DMF indicate normal behaviour. the presence of 2,4-dihydroxy acetophenone introduces antioxidant and antimicrobial properties of copolymer.

ON THE IMPLEMENTATION OF NOVEL APPROACH FOR CLUSTERING USING WEB MINING

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Abstract

The exponential growth of the internet has led to an overwhelming amount of data, necessitating efficient technique for organizing and extracting valuable insights. Clustering, is a fundamental unsupervised machine learning technique plays a crucial role in web mining by grouping similar data objects based on predefined similarity measures. Web mining, which involves extracting useful information from web data, consists of three primary categories: web content mining, web structure mining, and web usage mining. This paper explores the integration of clustering techniques within web mining to enhance information retrieval, user profiling, and knowledge discovery. The clustering process in web mining typically employs algorithms such as K-Means, hierarchical clustering, DBSCAN, and self-organizing maps (SOM). K-Means is widely used due to its efficiency in handling large-scale web datasets, but it suffers from sensitivity to initial centroid selection. Hierarchical clustering provides a more interpretable structure but is computationally expensive for large datasets. Density-based clustering methods such as DBSCAN effectively identify arbitrary-shaped clusters and outliers, making them suitable for web usage mining. Moreover, deep learning-based clustering techniques are emerging as powerful tools for processing complex web data. In web content mining, clustering aids in document categorization, topic detection, and automatic summarization. Search engines leverage

clustering to improve query results by grouping related web pages, thereby enhancing user experience. In web structure mining, clustering techniques analyze hyperlink structures to identify communities and influential nodes within a network, which is particularly beneficial for search engine ranking algorithms. Web usage mining benefits significantly from clustering by segmenting users based on browsing behaviour, enabling personalized recommendations and targeted advertising.

In this paper we have proposed an effective clustering technique in web mining depends on the choice of similarity measures and feature selection. Traditional measures such as Euclidean distance and cosine similarity are commonly used, but advanced methods incorporating semantic similarity and deep embeddings are gaining popularity. Feature extraction techniques, including term frequency-inverse document frequency (TF-IDF) and word embeddings like Word2Vec, play a vital role in improving clustering quality.

Keywords: Clustering, Web Mining, K-Means, Hierarchical Clustering, DBSCAN, Web Content Mining, Web Structure Mining, Web Usage Mining.

PHOTOCATALYTIC APPLICATIONS OF NANOSTRUCTURED NANOCOMPOSITE OF CEO AND DOPANDS BY USING SOL-GEL METHOD

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Abstract

Nanostructured nano particles have an emerging trend in various field like Biomedical, Medicinal industry for water purification treatment, and photo catalytic application. For atmosphere as well as human welfare the synthesis of metal oxide based nanoparticles is efficient material. Metal oxide based nanostructured nano particles has been synthesized and their photo catalytic applications have been studied by using methylene blue dye. The CeO metal oxide nanoparticles has been synthesized by using sol-gel method as a basic compound and their modified nanostructures are synthesized by using 3%,5%,7% and 9% of SrO dopant, at different temperature. Sol –gel basic method was used because of its low cost, more effectiveness and less hazardous for environment. Photo catalytic applications were studied by using methylene blue dye which are degrade by synthesizing nanoparticles catalyst at different time interval and confirmed by different techniques of characterization like XRD, FTIR , UV-Spectroscopy and SEM,TEM techniques.

Keywords: Nanocomposite, Metal Oxide, Methylene Blue, Photo Catalysis.

EXPLORING THE EFFECTS OF MICROPLASTICS ON REPRODUCTIVE HEALTH

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Abstract:

Microplastics, characterized by their complex physical and chemical properties, infiltrate the food chain and pose significant risks to ecosystems. While environmental pollution is recognized as a factor contributing to declining fertility, the precise mechanisms by which microplastics affect reproductive health remain

unclear. This review explores the global link between microplastics and subfertility, highlighting their entry pathways and ecological impacts. Studies indicate that microplastics disrupt the neuroendocrine system, altering sex hormone production via the hypothalamic-pituitary-gonadal (HPG) axis. In males, they compromise the blood-testis barrier and impair spermatogenesis, while in females, they contribute to placental dysfunction, ovarian atrophy, endometrial hyperplasia, and fibrosis. Additionally, microplastics may influence lipid metabolism and reproductive functions in offspring. However, research is hindered by the complexity of microplastic composition and limitations in detection methods. Addressing these reproductive health risks requires both mitigation strategies and sustainable approaches to reduce microplastic pollution. This review emphasizes the urgent need for global collaboration and research efforts to protect reproductive health amid rising microplastic contamination.
Keywords: Microplastics, Reproductive Health, Subfertility, Neuroendocrine Disruption, Hypothalamic-Pituitary-Gonadal (HPG) Axis.

SYNTHESIS, CHARACTERIZATION, AND PROPERTY TUNING OF CR-SUBSTITUTED SRTIO₃ PEROVSKITE OXIDES

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Abstract:

Chromium-doped strontium titanate (Cr-doped $SrTiO_3$) perovskite nanoparticles were successfully synthesized using a facile hydrothermal method. The structural properties were confirmed by X-ray diffraction (XRD), which showed a cubic perovskite structure with slight shifts in peak positions due to Cr incorporation into the $SrTiO_3$ lattice. Fourier-transform infrared spectroscopy (FTIR) further verified the formation of $SrTiO_3$ through characteristic Ti-O vibrations, along with additional Cr-O bands. Morphological analysis using scanning electron microscopy (SEM) and transmission electron microscopy (TEM) revealed cubic-shaped nanoparticles with uniform size distribution, while energy-dispersive X-ray spectroscopy (EDS) confirmed the homogeneous distribution of Cr within the structure. Surface analysis via X-ray photoelectron spectroscopy (XPS) identified Cr in the +3 oxidation state, indicating successful substitution into the Ti^{4+} sites and highlighting the role of Cr in modifying the local electronic environment. The combined characterization results demonstrate that Cr doping introduces lattice strain, alters surface chemistry, and enhances defect formation, all of which are expected to improve the material's dielectric, properties, making it a promising candidate for supercapacitor applications.
Keywords**:** Chromium, nanoparticles, perovskites, doping, supercapacitor.

AMBERLITE XAD-2 RESIN FUNCTIONALIZED WITH 1-NITROSO-2-NAPHTHOL: SYNTHESIS AND THERMOGRAVIMETRIC ANALYSIS

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Abstract :

Amberlite XAD-2 has been functionalized by coupling it to 1-Nitroso-2-Naphthol by means of an -SO_2 spacer. Intermediates formed in a reaction and the final

product was characterized by FTIR method. Elemental analysis, thermogravimetric analysis, and infrared spectra were used to characterize the resulting new polymer matrix (1-Nit 2-Nap-SO_2-AXAD-2). Thermo-kinetic parameters of functionalized resin such as activation energy (Ea), free energy changes (ΔG), entropy change (ΔS) and order of degradation (n) were calculated by Freeman-Carroll (FC) and Sharp-Wentworth (SW) methods. The order of degradation (n) obtained by the FC method was finally confirmed by SW method. Activation energy and entropy change calculated by both of these methods were found to be in good agreement. Low values of frequency factor suggest slow degradation of functionalized resin.

***Keywords*:** Amberlite XAD-2, Resin, Thermogravimetry, Thermo-kinetics.

SYNTHESIS OF COPPER OXIDE@ POLYANILINE NANOCOMPOSITE FOR POTENTIOMETRIC DETECTION OF METAL ION

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Abstract:

Copper oxide@ Polyaniline (CuO@PAni) have been synthesized by Chemical oxidation in-situ polymerization method. The nanocomposites have been analyzed by various analytical techniques like, X-Ray Diffraction, FESEM, DLS, FT-IR spectroscopic etc. The average size of these particles as calculated by plotting a Histogram with Gaussian distribution curve is 68.9 nm. The synthesized particles possess granule like morphology with zeta potential value of be +2.6 mV. The various factors that affect the yield of nanocomposite have also been determined. These nanocomposites have been used as sensors to determine the trace level concentration of nickel ions. CuO@PAnibased membrane electrode show excellent limit of detection, i.e., 6.31×10^{-7} M with Nertian slope 24.70 ± 2.5mV $decade^{-1}$ and the real life application of the developed electrode along with nickel ion–EDTA complexometric titration has also been studied.

SYNTHESIS OF CHALCONES BEARING QUINOLINE MOIETY BY GRINDING REACTANTS AND TESTING ITS ANTIMICROBIAL ACTIVITY: A GREEN APPROACH

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Abstract

Green chemistry is the need of the day and hence it was planned to synthesize chalcone in an ecofriendly way without using solvents and technology has shifted more toward environmental and sustainable resources and progress. Present study focuses on the synthesis of three different derivatives of chalcones bearing a quinoline moiety simply by grinding the 1-(2,4-dihydroxyphenyl) ethenone and three different substituted quinoline aldehyde without solvent. The newly synthesized chalcones without solvent was obtained in good yield and its formation is confirmed by physical and spectral characteristics. It was one of the green approaches for the synthesis of chalcones without solvent. Further compounds shows better zone of inhibition tested against. S. aureus and E. coli.

SYNTHESIS, SPECTROSCOPIC CHARACTERIZATION, AND THERMAL CONDUCTIVITY OPTIMIZATION OF SCHIFF-BASE AND PHENYLTHIOUREA-MODIFIED EPOXY SYSTEMS

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Abstract

The present study delineates the synthesis of three novel diglycidyl monomers functionalized with phenylthiourea and azomethine moieties, employing 4,4′-diaminodiphenyl ether, 4,4′ diaminodiphenylmethane, and 4,4′-diaminodiphenyl sulfone as molecular precursors. The structural elucidation of the synthesized monomers was accomplished through Fourier transform infrared (FTIR) spectroscopy and proton nuclear magnetic resonance (1H-NMR) spectroscopy. These monomers were subsequently incorporated into an epoxy-based trickle impregnation resin (Dobeckot 605) and subjected to a curing protocol. The thermomechanical and thermal characteristics of the resultant cross-linked networks were investigated via thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). The incorporation of 3 wt% of the synthesized di-glycidyl monomers did not perturb the inherent thermal stability of the cured matrices; however, a substantial enhancement in thermal conductivity was observed. The thermal conductivity of the modified epoxy networks exhibited an approximate 1.9-fold augmentation relative to the pristine epoxy-based trickle impregnation resin and demonstrated parity with epoxy composites incorporating 20 wt% inorganic fillers.

Keywords: Azomethine; Diglycidyl monomers; Phenylthiourea; Thermal conductivity

AC CONDUCTIVITY AND DIELECTRIC PROPERTIES OF PEROVSKITE-TYPE LAMNO$_3$ BASED NANOSTRUCTURES SYNTHESIZED BY SOL-GEL METHOD

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Abstract:

The perovskite-type nanocrystal $LaMnO_3$ was prepared using sol-gel method with citric acid as the chelating agent. The nanoparticles were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared (FTIR) spectroscopy. The ac conductivity and dielectric properties of these nanoparticles were also studied from room temperature (RT) to 700^0 C in the range of 42Hz to 50KHz. The variation of ac conductivity as a function of frequency indicated the possibility of hopping mechanism for electrical process in the system with a non-exponential type of conductivity relaxation. Dielectric constant of $LaMnO_3$ decrease at low frequency, while it was found to be constant at high frequency.

***Keywords*:** $LaMnO_3$(LMO), X-ray diffraction (XRD), Dielectric Constant (ε').

PHOTOCATALYTIC DEGRADATION OF RHODAMINE B DYE BY CICER ARIETINUM HUSK FOR EFFECTIVE WASTEWATER TREATMENT BY GREEN CHEMISTRY

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Abstract:

In the reported work, the outer husk of chickpea, an abundant agro-industrial processing residue available in India. The chickpea husk was washed and calcinated at 800ºC for 2 hours. The calcinated sample was characterized by FTIR, SEM-EDAX and XRD technique. The photocatalytic adsorption and degradation was studied in working wavelength range of light from ultraviolet (UV) to visible. It was found that under ideal condition 80% of the Rodamine B dye was destroyed by chickpea sample within 240 min of exposure to visible light. Scavenging testing confirmed that OH and hole were the principal reactive radicals involved in the degradation process.

ULTRASONIC STUDIES OF PLASTICIZER SOLUTIONS

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Abstract

Current works on the equilibrium and active properties of polymer solutions obtained from ultrasonic measurement. Dissolved states of polymer in solutions, the amount of solvated solvent and hydrated water, and the degree of counterion binding of polyelectrolytes were discussed on the basis of sound velocity measurement at a few MHz. ultrasonic relaxation processes in the frequency range from several hundred KHz to a few hundred MHz were interpreted by local segmental motion of polymer in solution. The ultrasonic degradation of plasticizer in solutions is briefly discussed.
Keywords: ultrasonic degradation, ultrasonic velocity, ultrasonic relaxation processes.

DEGRADATION OF RHODAMINE B DYE USING BIOCHAR AND SYNTHESIZED ZNO/BIOCHAR PHOTOCATALYSTS TO STUDY THE SYNERGISTIC EFFECT OF PHOTOCATALYSIS AND ADSORPTION

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Abstract:

Biochar derived from bio wastes are used as an effective adsorbent. However, modification of the carbon-based material biochar to use it, as an effective photocatalyst in visible light remains a challenge. This study presents the oxidation of pyrolyzed polanga seeds biochar by dispersing the biochar in HNO_3 through sonication process. The oxidized biochar was used for synthesis of ZnO/biochar photocatalyst (1:10 w/w) by co-precpitation method. Several characterization techniques XRD, FTIR, BET, SEM-EDS, UV-DRS and Raman spectroscopy were performed to test the properties of ZnO/PSB photocatalyst. The ZnO/biochar photocatalyst showed enhancement in the specific surface area (234.2 m^2/g) due to oxidation of biochar. The reduction in the band gap energy was found out from tauc

plot. The parametric studies were performed to find out the optimal conditions (pH =2, photocatalyst dosage 1.2 g/L, contact time of 40 minutes, and 8 mg/L initial concentration of dye). The photocatalytic reaction followed 1st order kinetics. NaOH (0.1 N) was used for desorption study of Rhodamine b dye (99.2 %) from the ZnO/biochar photocatalyst. The regeneration study confirmed that the photocatalyst can be reused upto 3 cycles without effecting the degradation percentage much. Based on the results, photocatalysis showed more degradation % than adsorption.

***Keywords*:** Rhodamine Blue; Polanga seeds; Biochar; Photocatalyst; Spontaneous

THE STUDY ON THERMAL BEHAVIOR OF CONDUCTING ELECTROACTIVE PPY ON INCORPORATION OF XANTHENE DYE: FLUOROSCEIN AS A DOPANT IN ITS POLYMERIC STRUCTURE

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Abstract

The research paper aims to elucidate the impact of Fluorescein; a xanthene dye dopant on the thermal properties of PPy, with a focus on understanding changes in stability, phase transitions, and thermal decomposition. The synthesis methodology involves the in situ oxidative chemical polymerization of pyrrole in the presence of ammonium peroxydisulphate as an oxidant. Furthur preparation of PPy/Fluorescein composite is done by mixing fluorescein solutions at different concentrations during polymerization proceeds., and the resulting PPy/Fluorescein composite is thoroughly characterized using advanced techniques. The resulting material is subjected to extensive thermal characterization using thermogravimetric analysis (TGA) and differential Thermal Analysis (DTA). The results successfully elucidate the thermal stability, decomposition kinetics, and heat flow characteristics of the composite, providing insights into the influence of fluorescein on PPy's thermal behavior.

SYNTHESIS, CHARACTERIZATION, THERMAL AND PHOTOLUMINESCENT STUDIES OF NEWLY SYNTHESIZED METAL COMPLEXES SULPHANLIC ACID-THIOUREA-FORMALDEHYDE Cu(II)-Ni(II)

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Abstract:

The copolymer have been synthesized by the condensation of sulphanilic acid (SA), thiourea (T) with formaldehyde (F) using 2M HCl as a catalyst in a 1:1:2 ratio of monomers. By using this terpolymer as ligand synthesized metal complexes with two transition metal ions Cu(II) and Ni(II) in 2:1 molar ratio. The reaction conducted for 3hrs with an efficient reflux maintained at 60 °C temp. The synthesized metal complexes have been characterized using UV-Visible spectroscopy, NMR, FTIR, SEM and XRD. Elemental composition of SATF-I-M copolymeric metal complexes

were analyzed by elemental analysis method. Thermogravimetric analysis was utilized to evaluate the thermal stability of the terpolymer ligand metal complexes, with the activation energy determined using the Freeman-Carroll and Sharp-Wentworth methods based on TGA data. The photoluminescence properties of the newly synthesized copolymer metal complexes were analyzed using the RF-501 (PC) S CE (LVD) MODEL PL spectrometer, which measured the spectra of complexes containing two transition metal ions. The primary objective of this study is to develop novel polymeric metal complexes and explore their photoluminescent properties, while also acknowledging the valuable contributions of active researchers in the field.
Keywords*:* terpolymer, metal complex, characterization, thermal degradation, morphology, photoluminescence.

SYNTHESIS AND CHARACTERIZATION OF METAL OXIDE BASED NANOSTRUCTURED, NANOCOMPOSITE OF NIO AND DOPPING OF CaO AND THEIR ANTIMICROBIAL ACTIVITY

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Abstract

The nanostructured nanocomposite has been synthesized by using sol-gel method. The nano particles synthesizing is an emerging for welfare of society due to having a tendency of medicinal sector, industrial and purification of water, The synthesized nanocomposite of NiO has been synthesized by using sol-gel method as a basic compound and dopped by metal oxide of Ca to enhance the catalytic ability of Synthesized nanoparticles at their different percentage like 3%,5%,7%and 9% at their 650°c. And their antimicrobial activity has been studied by using E. Coli and S. Aureus bacteria and characterized by different techniques like XRD, FTIR, UV spectroscopy techniques.
Keywords: Nanocomposite, Metal-oxide, Sol-gel, Antimicrobial Activity.

ADVANCEMENTS OF STRATEGIES TO PERFORM SURGERY USING ELECTROSURGICAL UNIT

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Abstract

The quick development of electrosurgical technology demonstrates the ongoing push to improve blood coagulation and expedite surgical procedures. As a result of these developments, surgeons can now utilize a wide variety of instruments for both open and endoscopic procedures. A range of therapeutic results, from simple coagulation to the closure of large vascular bundles, can be obtained depending on the particular device used. However, these advancements also come with some disadvantages. Both the surgeon and the patient might benefit from a thorough understanding of benefits and drawbacks of such technological advancements.
***Keywords*:** Monopolar Electrosurgery, Bipolar Electrosurgery, Electrosurgery; Laparoscopy; Gynecologic surgery.

REVOLUTIONIZING E-COMMERCE RECOMMENDATIONS: AI INNOVATIONS, ETHICAL CHALLENGES, AND FUTURE PROSPECTS

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Abstract

Recommender systems have become a cornerstone of modern e-commerce, enabling personalized product recommendations that enhance user experience and drive business growth. These systems leverage artificial intelligence (AI) and machine learning techniques, such as collaborative filtering, content-based filtering, and hybrid approaches, to analyze user behavior and predict preferences. However, despite their effectiveness, e-commerce recommender systems face several challenges, including the cold start problem, data sparsity, scalability issues, bias, privacy concerns, and the risk of filter bubbles. Addressing these challenges is crucial to improving recommendation accuracy, fairness, and transparency. This research explores the key limitations of current recommender systems and examines emerging trends that can enhance their performance. The study conducts a comprehensive review of recent advancements in AI-driven recommendations, including deep learning-based models, reinforcement learning, graph neural networks, and explainable AI (XAI). Additionally, it evaluates privacy-preserving techniques such as federated learning and differential privacy to address data security concerns.

Findings suggest that integrating context-aware recommendation models, multi-modal data processing, and ethical AI frameworks can significantly improve personalization and user trust in e-commerce platforms. The study highlights the importance of balancing recommendation accuracy with fairness and privacy, offering potential solutions for future research and practical implementation. By addressing the challenges and leveraging cutting-edge AI techniques, e-commerce platforms can develop more robust and user-centric recommender systems, ultimately enhancing customer satisfaction and business success.

Keywords: Recommender Systems, E-Commerce, Personalization, Graph Neural.

SENTIMENT ANALYSIS OF TWITTER DATA USING NATURAL LANGUAGE PROCESSING (NLP)

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Abstract:

Natural Language Processing (NLP) is an essential technique for deriving meaningful insights from unstructured textual data available on the web. This research focuses on NLP approaches for web content mining, emphasizing sentiment analysis in social media platforms like Twitter.

It examines key text preprocessing strategies, including tokenization, stemming, lemmatization, and stop-word removal, to enhance the quality of raw textual data. Furthermore, this study evaluates various NLP-powered machine learning models, ranging from traditional classifiers like Naïve Bayes and Support Vector Machines (SVM) to advanced deep learning frameworks such as Long Short-Term Memory (LSTM), Convolutional Neural Networks (CNN), and attention-based architectures. The study also addresses significant challenges in sentiment analysis,

such as detecting sarcasm, handling negation, interpreting domain-specific language, and processing multilingual content. By integrating cutting-edge NLP methodologies, this research aims to enhance the accuracy, efficiency, and interpretability of sentiment classification in web content mining.

With the increasing influence of social media, platforms like Twitter generate massive amounts of textual data that provide valuable insights into public sentiment, trends, and opinions. This study explores web content mining through NLP-driven sentiment analysis, utilizing methods to examine and classify tweets. Real-time tweets are retrieved using the Twitter Developer API and undergo text processing techniques such as tokenization, stop-word removal, and lemmatization to standardize the data before sentiment classification.

Keywords: Sentiment Analysis, Natural Language Processing (NLP), Machine Learning, Deep Learning, Social Media Mining, Twitter Data Analysis.

IDENTIFICATION OF INHIBITORS CYP3A4 AS POTENTIAL ANTI-CANCER AGENTS USING PHARMACOINFORMATICS APPROACH

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Abstract

Biguanide derivatives exhibit a wide variety of therapeutic applications including anti-cancer effects. Metformin has been shown to be effective anti-cancer against breast cancer, lung cancer, and prostate cancer. Metformin bound to the active site-heme of CYP3A4 (PDB ID: 5G5J) in a co-crystal structure was reported and the associated anti-cancer effect was explored. Taking clues from this work, pharmacoinformatics research has been carried out on a series of known and virtual biguanide, guanylthiourea (GTU), and nitreone derivatives. This exercise led to the identification of more than 100 species that exhibit greater binding affinity towards CYP3A4, in comparison to that of metformin. Selected six molecules were subjected to molecular dynamics simulations, the results are presented in this work.

***Keywords*:** Pharmacoinformatics, anti-cancer agent design, virtual screening.

SIGNIFICANT PHYTOCONSTITUENTS FROM THE METHANOL AND ETHANOL EXTRACTS OF *CORCHORUS DEPRESSUS (LINN.)* LEAVES

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Abstract:

***Background*:** *Corchorus depressus (Linn.)* A species of the Tiliaceae family, has been acknowledged for its numerous medicinal benefits, notably in traditional medicine in India and Pakistan. Recent research strengthens its ethnopharmacological claims, emphasizing its potential for wound healing, antimicrobial activity, and cytotoxic effects on cancer cells.

***Objectives*:** The current study aimed to isolate and structurally characterize new phytoconstituents from two solvent extracts of *Corchorus depressus (Linn.)* leaves.

***Materials and methods*:** *Corhorus depressus (Linn.)* dried leaves were extracted

using cold maceration with methanol and ethanol as solvents. Column chromatography was used to separate three phytoconstituents: ME-1, ME-2, ETH-1, and ETH-2.

***Results*:** The four isolated compounds were identified based on their melting points and R_f values. The precise structures were established by the isolated compounds' CHN analysis, IR, NMR, and mass spectral data.

CHEMICAL PATHWAYS TO SUSTAINABLE ENVIRONMENTAL SYSTEMS: INNOVATIONS IN RENEWABLE ENERGY AND POLLUTION MITIGATION

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Abstract

The global shift towards sustainable environmental systems is increasingly reliant on innovative chemical pathways that facilitate the advancement of renewable energy technologies and pollution mitigation strategies. This research explores the role of chemical processes in the development of energy systems that minimize environmental impacts, focusing on the integration of renewable energy sources such as solar, wind, and bioenergy. By utilizing advanced materials, catalysts, and chemical reactions, significant strides have been made in improving energy conversion efficiency, storage, and distribution. Additionally, novel chemical strategies for mitigating pollutants—ranging from greenhouse gases to toxic waste—are also discussed. These pathways include carbon capture and storage, wastewater treatment technologies, and the development of sustainable chemical processes. By emphasizing interdisciplinary approaches that combine chemistry, engineering, and environmental sciences, this work underscores the potential for achieving long-term environmental sustainability and highlights future challenges and opportunities in the chemical innovations that drive clean energy and pollution reduction.

Keywords: Sustainable Environmental Systems, Renewable Energy, Chemical Pathways, Energy Conversion, Pollution Mitigation, Carbon Capture.

KINETIC STUDY OF THE OXIDATION RATES OF 1-HEXANOL AND CYCLOHEXANOL USING N-CHLOROSUCCINIMIDE IN ALKALINE MEDIUM

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Abstract

Oxidation is one of the prime important industrial reactions as it gives very useful products. Various organic and inorganic oxidants have been used for the oxidation. The present study deals with the oxidation of alcohol to corresponding carbonyl compounds. The quantitative conversion of alcohols to aldehyde/ketone has been studied. Kinetic studies of primary (1-Hexanol) and secondary (Cyclohexanol) alcohols have been carried out using N-Chlorosuccinimide in alkaline medium. 1-Hexanol is used in perfumery industry and Cyclohexanol is used in the manufacture of polymers.

The oxidation studied is under first order kinetic condition with respect to oxidant. The progress of oxidation is monitored by iodometry estimation of the

unreacted oxidant at regular time intervals, for both the alcohols. The oxidation rate increases with alcohol concentration but decreases with oxidant concentration. The oxidation rate followed the sequence 1-hexanol > Cyclohexanol. The reaction is found to be independent of ionic strength (μ). A number of thermodynamic characteristics were established based on the impact of temperature on the pace of oxidation process. Appropriate reaction mechanisms have been proposed for the oxidation of alcohols.

Keywords: Oxidation of alcohols, organic oxidants, iodometry, ionic strength

SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITIES OF SOME NEW PYRAZOLINE DERIVATIVES

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Abstract

Pyrazolines are well known and important nitrogen containing five membered heterocyclic compounds and various methods have been worked out for the synthesis of pyrazoline derivatives. Pyrazoline derivatives possess important pharmacological activities and therefore they are useful materials for drug research**.** The pyrazoline derivatives exhibited extensive chemical and pharmacological properties. Pyrazoline derivatives are known to be biologically active compounds and substituted pyrazoline have shown wide range of biological activities. The present work synthesis of a series of substituted pyrazoline derivatives have been synthesized by the reaction of 1-(substituted-phenyl)-3-(4'-dimethylamino-phenyl)-prop-2-en-1-one (0.001mol) with thiosemicarbazide (0.001mol) by using 10 ml ethanol as a solvent and adding ethanolic NaOH, the reaction mixture was refluxed for 10 hrs, after completion of reaction (checked by TLC). The content was cooled and poured into beaker containing crushed ice, the solid obtained was filtered, washed with water and recrystallized from ethanol. In 60-75% yield with high purity, characterization of compounds was confirmed by the IR, ^{1}H NMR and mass spectral analysis. All these newly synthesized compounds were evaluated for their antimicrobial activities.

Keywords: 2-Hydroxychalcones, thiosemicarbazide, Antimicrobial activity.

MECHANICAL AND THERMAL PROPERTIES OF GLASS FIBER REINFORCED PEEK COMPONENTS FABRICATED USING FUSED FILAMENT FABRICATION

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Abstract:

This study investigates the mechanical and thermal properties of Polyetheretherketone (PEEK) and Glass Fiber (GF) reinforced PEEK fabricated using the Fused Filament Fabrication (FFF) process. Specimens were printed in three build orientations X, Y, and 45° to evaluate the influence of layer deposition on material performance. Tensile and flexural tests revealed that GF-PEEK exhibited significantly higher Ultimate Tensile Strength (110 MPa in X-orientation), Young's Modulus (4.5

GPa), and Flexural Strength (180 MPa) compared to PEEK, attributed to the reinforcing effect of Glass Fibers. However, a reduction in Elongation at Break indicated increased brittleness. The X-orientation showed superior mechanical properties due to layer alignment with the loading direction, while 45° orientation demonstrated lower values due to increased interlayer shear. Thermal analysis using TGA and DSC demonstrated enhanced thermal stability and degree of crystallinity for GF-PEEK, with an initial decomposition temperature of 590°C and a 38% crystallinity, owing to the nucleating effect of Glass Fibers. Comparative analysis with existing literature confirmed the positive impact of Glass Fiber reinforcement on both mechanical and thermal performance. This study establishes the potential of GF PEEK for high-performance applications requiring enhanced stiffness, strength, and thermal resistance. The novelty of this research lies in the comprehensive evaluation of build orientations and their impact on mechanical and thermal properties, providing new insights for optimizing FFF-printed composite materials. The findings also highlight the significant role of build orientation in optimizing mechanical behavior, paving the way for future advancements in 3D-printed composite materials.

Keywords: PEEK, Glass Fiber, Fused Filament Fabrication, Mechanical Properties.

APPLICATIONS OF NANOCOMPOSITE MATERIALS AND POLYMERS

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Abstract:

Nanocomposite materials, consisting of polymers like polyethylene, polystyrene, polyurethane matrices embedded with different types of nanoparticles like gold, silver, graphene etc. have revolutionized various industries due to their enhanced mechanical, thermal, electrical, electronics, biomedicine and barrier properties. These advanced materials exhibit superior performance compared to conventional composites, making them highly valuable in diverse applications.

1. Automotive and Aerospace: Nanocomposite polymers improve fuel efficiency by reducing vehicle weight while maintaining high strength and durability. In aerospace, they enhance thermal resistance and structural integrity, making them ideal for lightweight yet strong components.

2. Packaging Industry: Polymer-based nanocomposites significantly improve barrier properties, making them ideal for food packaging. They enhance moisture resistance, extend shelf life, and provide antimicrobial properties, reducing food spoilage.

3. Biomedical Applications: Nanocomposites play a crucial role in medical devices, drug delivery systems, and tissue engineering. Their biocompatibility and improved mechanical properties contribute to advanced prosthetics, antimicrobial coatings, and targeted drug release mechanisms.

4. Electronics and Energy Storage: Polymer nanocomposites are widely used in flexible electronics, sensors, and energy storage devices. Their high electrical conductivity and thermal stability make them suitable for batteries, supercapacitors, and lightweight electronic components.

5. Construction and Coatings: These materials enhance the durability and fire resistance of construction materials. They are used in coatings for corrosion resistance, self-cleaning surfaces, and UV protection in buildings and infrastructure.

6. Environmental and Sustainable Solutions: Nanocomposite polymers contribute to sustainable solutions, such as water purification membranes and biodegradable

plastics. They help in environmental remediation by improving filtration efficiency and reducing plastic waste.

Keywords: Nanomaterials, polyurethane, targeted drugs delivery, optical applications

HARNESSING CAR-T CELL THERAPY FOR REVOLUTIONIZING IMMUNO-ONCOLOGY FOR TARGETED CANCER CELL TREATMENT

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Abstract:

Chimeric Antigen Receptor T-cell (CAR-T) therapy has emerged as a transformative approach in cancer treatment, particularly in hematologic malignancies such as B-cell lymphomas and acute lymphoblastic leukemia (ALL). This innovative therapy involves genetically modifying a patient's T cells to express chimeric antigen receptors that specifically target antigens on cancer cells. Upon reintroduction into the patient's body, the modified T cells recognize and eliminate cancer cells, offering a more targeted treatment with the potential for long-term remission and survival. CAR-T therapy has demonstrated significant clinical success, especially with FDA-approved treatments like Kymriah and Yescarta, which have shown remarkable response rates in treating refractory cancers. However, challenges such as cytokine release syndrome (CRS), neurotoxicity, and limited efficacy against solid tumors remain significant obstacles. Researchers are focusing on improving CAR-T cell design through next-generation therapies that incorporate multiple co-stimulatory signals, bispecific targeting, and the inclusion of safety mechanisms like suicide genes. Additionally, efforts are being made to reduce the high cost of CAR-T therapy and expand its accessibility, especially in low- and middle-income countries, by developing off-the-shelf therapies. Beyond oncology, CAR-T therapy is being explored for applications in autoimmune diseases and other conditions, broadening its therapeutic potential. As research continues, CART therapy is poised to revolutionize personalized medicine, offering new hope for patients with cancers that were once.

MATHEMATICS FOR A SUSTAINABLE FUTURE: APPLICATIONS IN SCIENCE

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Abstract

Mathematics is a fundamental tool that enables scientific advancements and plays a vital role in promoting sustainability across various disciplines. This paper explores the applications of mathematical modeling, computational techniques, and statistical analysis in fostering sustainability within environmental science, renewable energy, economic stability, and healthcare. By integrating mathematical principles, scientists can develop innovative and sustainable solutions to address global challenges, ensuring long-term environmental and societal well-being.

COMPARATIVE STUDY OF STRONTIUM AND OTHER DIVALENT METAL-DOPED COBALT FERRITES: STRUCTURAL, MAGNETIC, AND ELECTRICAL PROPERTIES

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Abstract:

This study presents a comparative analysis of divalent strontium (Sr) doped cobalt ferrite ($CoFe_2O_4$) and other divalent metal-doped cobalt ferrites, including manganese (Mn), nickel (Ni), copper (Cu), and zinc (Zn). Cobalt ferrite is a well-known magnetic material with a spinel structure, and doping with divalent metals can significantly influence its structural, magnetic, electrical, and thermal properties. The substitution of Sr^{2+} ions in place of Co^{2+} ions increases thermal stability and enhance the electrical conductivity of the material, while simultaneously decreasing the magnetization and coercivity. In comparison, Mn, Ni, Cu, and Zn doping also affects the magnetic properties, with Mn^{2+} and Ni^{2+} doping leading to reduced magnetization and coercivity, and Cu^{2+} and Zn^{2+} doping resulting in lower saturation magnetization and electrical resistivity. The study highlights the impact of doping on the lattice structure, magnetic behavior, and overall material performance, offering insights into how different divalent cations can be used to tailor cobalt ferrite properties for specific applications in electronics, sensors, & high-temperature devices.

Keywords: cobalt ferrite, strontium doping, divalent metal doping.

BIO-INSPIRED NANOBIOCHAR SUPPORTED COMPOSITE FOR ENHANCED ADSORPTION OF METHYLENE BLUE DYE

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Abstract:

The Nanobiochar supported biopolymer (Starch, Cellulose & Chitosan) composites have been used for the removal of methylene blue dye from water system. The agricultural based material corn stalk has been used for the synthesis of biochar by using pyrolysis method at 350^{o}C temperature. Then by using mechanical method converted into nanobiochar. NB- Starch, NB- Cellulose & NB- Chitosan composites have been prepared by mixing nanobiochar with biopolymers by using by free radical graft polymerization method. The composite materials were characterized using ultraviolet-visible spectroscopy (UV- VIS), fourier transform infrared spectroscopy (FTIR), x-Ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Adsorption experiments were performed to evaluate the adsorption capacity of as prepared composites (NB-Starch, NB-Cellulose, NB-Chitosan) using MB dye solution at pH 9.0 for 140 min under UV-Visible spectroscopy at wavelength 665nm up to 140 min. The NB-Starch composite was shown maximum adsorption capacity about 85%. NB-Cellulose composite was observed adsorption capacity about 70%. The NB chitosan composite has been observed minimum adsorption capacity about 63%.

A NEW CHELATE RESIN TO RESTORE HARMFUL METAL IONS MADE IN AQUEOUS SOLUTIONS AND ISOTHERMAL MODELS

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Abstract

A chelating resin was prepared for the detoxification of toxic metal ions using a synthesized tercopolymer involving 2,4-dihydroxyacetophenone,catechol and formaldehyde in 1:1:2 ratio. The resin was characterized by FTIR, 1H & 13C NMR spectroscopy and its morphology was established by SEM. The physico-chemical parameters have been evaluated for the terpolymer resin. Batch equilibrium method was employed to study the selectivity and binding capacity of the terpolymer resin toward certain metal ions such as Cu2+, Co2+, Ni2+, Zn2+and Pb2+ in different electrolyte concentrations, wide pH ranges and time interverals. The result proved that the resin can be used as a strong cation-exchanger to remove various metal ions from the solutions. The suggested resin has shown excellent metal ion recovery capability in comparison to commercial resins. The chelate resin possesses an exceptional ion-exchange capacity, which aligns well with isotherm models and kinetics. Keywords: Tercopolymer, SEM electrolyte, metal ions, ion exchange.

VILSMEIER-HAACK TRANSFORMATIONS: A NOVEL APPROACH

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Abstract:

Pyridine and Anisole and undergo acetylation and formylation under non-classical Vilsmeier-Haack conditions The reactants are vigorously ground in a mortar with a pestle for 25–30 minutes at room temperature, ensuring uniform mixing and efficient energy transfer, which facilitates the acetylation and formylation processes under solvent-free conditions. This mechanochemical approach eliminates the need for hazardous solvents, making the reaction environmentally friendly and sustainable while significantly reducing reaction time compared to conventional methods. The efficiency of this process arises from direct molecular interactions, enhanced by mechanical force, leading to high yields and selectivity. Notably, this method has not been previously reported in the literature, highlighting its novelty and potential impact on Vilsmeier-Haack reactions and green chemistry advancements. Compared to conventional solution-phase reactions, this approach offers significant advantages. It utilizes economically viable and readily available reagents, operates under mild and environmentally friendly conditions, and requires a simple workup at room temperature. Given these benefits, this study represents a major breakthrough in Vilsmeier-Haack synthesis.

***Keywords*:** Pyridines, Anisoles, Vilsmeier-Haack reaction, Dimethylformamide.

EFFICIENT AND ECO-FRIENDLY REMOVAL OF NI (II) FROM WASTEWATER BY LOW-COST ADSORBENTS

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Abstract

The present study emphasizes the utilization ability of less expensive industrial waste adsorbents such as fly ash (FA) to adsorb Ni (II) heavy metals from wastewater to remove its constituent pollutants. In the extended experimental work program: parameters such as pH, contact time, and adsorbent dosages were conducted. The results showed a remarkable treatment equilibrium time after two hours. From all the factors, the pH ranges from 5 to 8 significantly influenced the elimination of Ni (II) heavy metals removal efficiencies, and the highest achieved uptake efficiency during the whole three hours of the experiment period was found to be 96% with an optimum fly ash treatment dose of 10 g/L. Based on several performance metrics and visual indicators, different predictive regression-based models for wastewater heavy metals removal efficiencies were developed and compared to the experimental data. In addition, the experiment's data were utilized using the Langmuir isotherm model. The results of adsorption data were highly satisfactory statistically match providence to Langmuir heavy metals kinetics removal.

Keywords: Eco-friendly, fly ash, heavy metals, pollutants, wastewater.

ENERGY FROM CALCIUM SULPHATE DIHYDRATE (POP) WASTE

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Abstract:

The increasing burden Plaster of Paris (PoP) in the C&D waste sector necessitates innovative approaches for its valorization. This study investigates the electrochemical potential of waste-derived calcium sulphate ($CaSO_4$) from Plaster of Paris (PoP) as an electrolyte in a novel, low-cost galvanic cell. The electrolyte system consists of an agar-agar-based salt bridge containing KCl /NaCl to facilitate ionic conductivity. The cell operates with an observed voltage over 1V, indicating electrochemical activity driven by redox interactions between the graphite and the $CaSO_4$ based medium. Optimization strategies, including electrolyte concentration adjustments, electrode surface area enhancement, were explored to increase and stabilize the voltage output. The results emphasized the feasibility of repurposing industrial waste for sustainable energy generation, offering an eco-friendly, economically viable alternative for electrochemical applications. This work contributes to the development of waste-to-energy technologies, paving the way for greener and more resource-efficient energy solutions.

***Keywords*:** Plaster of Paris (PoP), Galvanic Cell, Waste-to-energy

SYNTHESIS OF SOME NEW 3-AMINO ALKYLATED INDOLE DERIVATIVES

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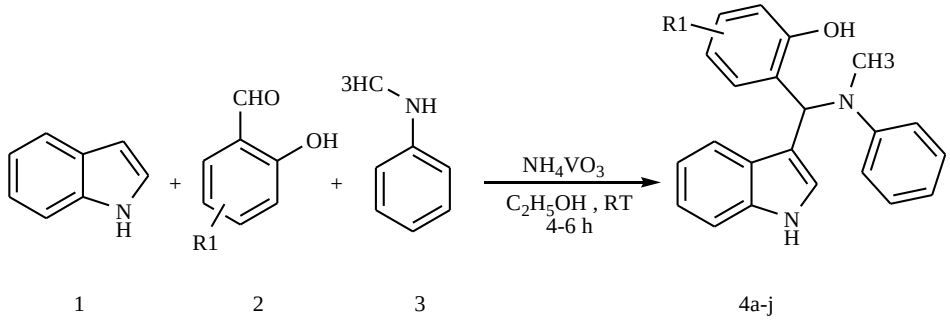
Abstract:

The indole is an important structural design which presented in a variety of natural products and having pharmaceutical interest in a several therapeutic areas. 3-

Substituted indoles are of great significance as they are widely scattered in nature and having a wide range of biological activities. 3-Substituted indoles with aminoalkyl/aryl substituents at 3-position are considered as impressive pharmacophores and are found in a variety of natural products such as 5-HT1B/1D with receptor agonist activities used in the treatment of migraine, aromatase inhibitor for breast cancer and HIV-1 integrase inhibitors Gramine. They have a variety of biological activities such as antibacterial, anticonvulsant and antihypertensive activity. Some of indoles moiety possess in bioactive metabolites of terrestrial and marine organisms. Because of significant chemical and biological properties of indole molecules, development in the efficient protocols for the synthesis of 3-substituted indoles constitutes a growing area in organic synthesis. Therefore herein, we describe an efficient method for the synthesis of 3-aminoalkylated indoles by the one-pot multicomponent reaction of aldehydes, amine and indole in the presence of Ammonium Metavanadate (10 mol %) as a catalyst in ethanol under ambient temperature condition for specified period of time. We found that this is a facile and efficient method for the synthesis of 3-aminoalkylated indoles. The prominent features of this method are the inexpensive reagents, simple and safe experimental procedure, short reaction times, excellent yield, no toxic waste and environmentally benign method (**Scheme1**).



1 2 3 4a-j

Scheme 1

INNOVATIVE FUNCTIONAL MATERIALS: DRIVING THE FUTURE OF ENERGY TECHNOLOGIES MOHAN KUMAR

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Abstract

Research on functional materials for energy applications has been fuelled by the world's rapidly increasing energy consumption and the pressing need for sustainable solutions. In several energy-related technologies, such as energy harvesting, conversion, and storage, functional materials are essential. They are very effective candidates for improving the performance of batteries, supercapacitors, fuel cells, and solar cells due to their distinct physicochemical characteristics. Because of their enormous surface area, outstanding stability, and tunable electrical characteristics, nanostructured materials in particular have drawn a lot of attention. High-efficiency energy conversion in solar and hydrogen fuel technologies is being made possible by materials like perovskites, metal-organic frameworks (MOFs), and two-dimensional materials. The development of next-generation lithium-ion and sodium-ion batteries is also being revolutionized by developments in solid-state electrolytes and electrode materials, which are increasing the batteries' energy density,

safety, and cycle life. Thermoelectric materials are an additional option that improves energy efficiency by converting waste heat into power. The potential for intelligent and portable energy solutions is also being increased by the exploration of functional polymers and composite materials for flexible and wearable energy devices. Notwithstanding these developments, issues including cost-effectiveness, scalability, and material deterioration continue to be major obstacles to commercialization. Researchers can open up new avenues for the development of effective, long-lasting, and ecologically friendly energy systems by addressing basic material attributes and engineering techniques. The development of new energy materials is further accelerated by the incorporation of artificial intelligence and computational modelling into material design. It is anticipated that functional materials will revolutionize the energy industry with ongoing developments, helping to create cleaner and more effective energy systems for coming generations.

Keywords: Functional materials, Energy storage, Energy conversion, Sustainable materials, Nanomaterials, Renewable energy.

THERMAL STUDIES OF COPOLYMER DERIVED FROM 2-AMINOTHIOPHENOL-ETHYLENEDIAMINE-FORMALDEHYDE

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Abstract:

As their superior qualities, such as increased density, strength, relatively large surface areas, flame retardancy, and thermomechanical/optoelectronic/magnetic properties, composites are regarded as promising advanced materials. As a result, in the modern era, they have a wide range of applications in many fields, such as luminescence, ion exchanger, antimicrobial, semiconductor devices, and many other highly significant uses. In the present study, our main aim was to synthesize and study the thermal properties of 2-aminothiophenol-ethylene diamine-formaldehyde copolymer. 2-Aminothiophenol, ethylenediamine, formaldehyde have been used for the synthesis of copolymer using polycondensation technique. Several physicochemical techniques, including UV-visible, SEM, TGA, and FTIR techniques, have been used to characterize the produced copolymer. The non-aqueous conductometric titration was used to determine the molecular weight of the copolymer. Based on Ea values determined by SW and FC technique for copolymer, it is observed that they are in good agreement with each other. It is abundantly obvious from the results of the sequence of reaction that the decomposition reaction roughly follows a first-order kinetics. The composite's higher surface area, porous makeup, and smaller particle size may have contributed to its superior performance.

***Keywords*:** Thermal analysis, copolymer, Kinetic parameters, polycondensation.

SYNTHESIS OF (E)-1-(4-SUBSTITUTED BENZYLIDENE)-3-PHENYL UREA DERIVED FROM 4-SUBSTITUTED BENZALDEHYDE AND PHENYL UREA

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Abstract:

This research focuses on the synthesis and spectral characterization of six different Schiff base ligands obtained through the condensation reaction between 4-

substituted benzaldehyde and phenyl urea. Schiff bases are versatile compounds widely employed in coordination chemistry and exhibit diverse applications in catalysis, biological systems, and materials science. The synthesis process involves the reaction of 4-substituted benzaldehyde with Phenyl urea by conventional method, resulting in the formation of Schiff base ligands. The choice of 4-substituted benzaldehyde imparts structural diversity and functionalization to the synthesized ligands. The synthetic procedure produced a range of six Schiff bases ligands with varying electronic properties, depending on the nature of the substituents on the benzaldehyde ring. The synthesized Schiff base ligands were extensively characterized using infrared (IR) spectroscopy, nuclear magnetic resonance (NMR) spectroscopy, and gas chromatography-mass spectrometry (GC-MS). Furthermore, the impact of different substituents on the benzaldehyde moiety on the spectral properties of the Schiff base ligands is explored, shedding light on the structure-activity relationship. The findings from this research contribute to the understanding of the synthesis and spectral behavior of Schiff base ligands derived from 4-substituted benzaldehyde and phenyl urea, paving the way for potential applications in coordination chemistry and related fields. Keywords: Schiff Base, 4-Substituted benzaldehyde, Phenyl urea, (E)-1-(4-substituted benzylidene)-3-phenyl urea, Ligands

SYNTHESIS, CHARACTERIZATION OF PURE AND NI, CO AND CU DOPED INDIUM OXIDE AND STUDY FOR ANTIMICROBIAL ACTIVITIES

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Abstract:

In this study, pure and Nickel, Cobalt and Copper doped Indium oxides were synthesized by the hydrothermal method. Several analytical investigative techniques are used to determine its structural and microstructural properties such as, Fourier transform infrared spectroscopy (FTIR), UV-visible diffused reflectance spectroscopy (UV-DRS), BET surface area, X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive spectrometer (EDS) as well as Thermogravimetric analysis (TGA). To study antimicrobial activity, synthesized pure and Nickel, Cobalt and Copper doped Indiun oxide was investigated for E-coli, Peseudomonas aeruginosa, Staphilococcus and Candila albicans. XRD analysis shows the cubic structure of indium oxide, cubic bixbyite structure of Ni doped indium oxide, orthorhombic structure for Cu doped indium oxide and cubic for Co doped indium oxide. SEM images prove cubic and cubic bixbyite surface morphology for synthesised materials; observed surface area by BET technique was reported 2.5573 m^2g^{-1} for indium oxide, 54.081 m^2g^{-1} for Ni doped, 18.372 m^2g^{-1} for Cu doped and 29.546 m^2g^{-1} for Co doped indium oxide. The antimicrobial study proves that doped Nickel and Copper doped indium oxide positively shows antimicrobial activities.

Keywords: Hydrothermal method, XRD, SEM-EDS, BET, Antimicrobial Activity.

POWDER AND LIQUID DETERGENTS COMPOSED ON SORBITOL AND ORGANIC ACID BASED POLYMERIC SURFACTANT

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Abstract

Laundry detergents or washing powder is a substance that is a type of cleaning agent that is added for cleaning laundry**.** Sorbitol based polymeric surfactant is successfully synthesized in laboratory and we found that it has a potential to be used as surfactant in detergents. In current work we made some formulations of powder and liquid detergents. Sodium lauryl sulphate, Sodium lauryl ether sulphate, acid slurry and sorbitol based polymeric surfactant are the main ingredients in it. We knowingly avoid alpha olefin sulphonate and sodium tripolyphosphate in all formulation. The performance characteristics like foam height, surface tension, bulk density, viscosity, pH and stain removing capacity on cotton cloth has been evaluated. We compare it with commercial powder and liquid detergents and we get almost comparable results.

***Keywords*:** Sorbitol, Organic acid, Eco-Friendly Powder and Liquid Detergents.

OPTIMIZED GROWTH, STRUCTURAL AND DIELECTRIC PROPERTIES OF AL-DOPED $KNBO_3$ SINGLE CRYSTALS

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Abstract:

This study presents the growth and characterization of Al-doped potassium niobate ($KNbO_3$) single crystals using a modified flux method. The optimization of growth conditions, including controlled reheating and slow cooling, resulted in high-quality, large-sized single crystals with minimized twinning. Structural analysis via X-ray diffraction (XRD) confirmed an orthorhombic crystal structure with space group PCCA and refined lattice parameters: a = 5.7009 Å, b = 3.9736 Å, and c = 5.7148 Å. Dielectric measurements were conducted at frequencies of 100 Hz and 1000 Hz across varying temperatures, revealing a Curie temperature around 430°C. A secondary dielectric anomaly near 225°C suggests an additional phase transition. The frequency-dependent dielectric behaviour indicates the material's potential for applications in high-performance capacitors and tunable dielectric devices.

Keywords: $KNbO_3$ single crystals, aluminium doping, flux method, X-ray diffraction.

FOUR COMPONENT SYNTHESIS OF POLYHYDROQUINOLINES UNDER CATALYST- AND SOLVENT-FREE CONDITIONS

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Abstract:

Polyhydroquinolines (PHQs) are an important class of heterocyclic compounds with significant pharmaceutical and biological applications. The

conventional synthesis of PHQs often involves the use of catalysts and organic solvents, which can pose environmental and economic challenges. In this study, we present an efficient and green methodology for the synthesis of polyhydroquinolines via a four-component reaction under catalyst- and solvent-free conditions. This method involves the reaction of an aromatic aldehyde, a primary amine, an enolizable ketone, and a cyclic 1,3-dione under mild thermal conditions. The reaction proceeds through a tandem Knoevenagel condensation, Michael addition, and cyclization mechanism, resulting in high yields of PHQ derivatives. The advantages of this protocol include its simplicity, cost effectiveness, eco-friendliness, and the elimination of hazardous reagents. The synthesized compounds were characterized by spectroscopic techniques, confirming their structures. This solvent- and catalyst-free approach provides a sustainable alternative for the synthesis of bioactive polyhydroquinolines, aligning with green chemistry principles. Keywords: Polyhydroquinolines, Four-Component Reaction, Catalyst-Free Synthesis, Solvent-Free Conditions, Green Chemistry, Knoevenagel Condensation, Michael Addition, Cyclization, Heterocyclic Compounds, Eco-Friendly Synthesis.

GREEN ROUTE SYNTHESIS OF SILVER NANOPARTICLES USING MARIGOLD FLOWERS

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Abstract:

In the present paper, we have reported the synthesis of silver nanoparticles via green process, using plant extract prepared using marigold flowers. Silver nanoparticles are known for its inhibitory and antibacterial properties. Marigold plant is also having various medicinal properties which makes it useful in all types of skin curing conditions, including contusions, bruises, and varicose veins. Minor skin injuries and inflammation can also be cured using marigold flowers. The objective of this work is to make use of phytochemicals obtained from marigold flowers extract to synthesize Ag nanoparticles which could be stable and biocompatible in medical applications. During the green synthesis, flower extract was prepared using Soxhlet extraction in aqueous medium which acts as a reducing and capping agent. The effect of concentration of extract, synthesis time and pH of the medium on the formation of Ag nanoparticles is studied. The phytochemical analysis of marigold flower extract shows the presence of flavonoids, alkaloids, terpenoids, quinones, sugars and phenols etc. Formation of silver nanoparticles was confirmed by the visual change in the colour of the solution from pale yellow to brown. Surface plasmon resonance of synthesized silver nanoparticles were observed at two different wavelengths viz 420 nm and 640 nm may be due to the formation of spherical as well as triangular shape nanoparticles. Absorption peak observed for extract at 500 nm is disappeared in Ag nanoparticles absorption spectra indicates phytochemical interaction with Ag ions. The intensity of SPR maxima due to Ag nanoparticles is increasing with the time demonstrates the growth of Ag nanoparticles with time. The varying volume ratio of 0.1M Ag salt: extract for Ag nanoparticles synthesis shows that increase in Ag salt concentration, nucleation and growth of nanoparticles is also increases.

PRELIMINARY PHYTOCHEMICAL INVESTIGATION OF *JACARANDA MIMOSIFOLIA*: A POTENTIAL SOURCE FOR PHYTOTHERAPEUTIC APPLICATIONS

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Abstract

In the field of ethnobotanical study, *Jacaranda mimosifolia*, a species that is well-known for its therapeutic benefits, has garnered focus due to the numerous bioactive components that it contains. The purpose of this research is to carry out an initial phytochemical evaluation of *J. mimosifolia* in order to determine the possible phytotherapeutic applications of this plant. An investigation of the presence of alkaloids, flavonoids, phenolics, tannins, saponins, and terpenoids in various solvent extracts was carried out through the use of qualitative screening. Secondary metabolites, in particular flavonoids and phenolics, which are renowned for their antioxidant and anti-inflammatory activities, were found to be abundant in the sample, as shown by the findings. Based on the presence of these bioactive compounds, *J. mimosifolia* has the potential to serve as a natural source for the development of drugs and therapeutic applications. In order to establish its therapeutic efficacy, the data lend credence to the need for more pharmacological and in-depth chemical study. Providing a basis for further research on *J. mimosifolia*, this study highlights the significance of the plant in the field of phytomedicine and the potential role it could play in the treatment of a variety of disorders.

Keywords: *Jacaranda mimosifolia*, phytochemical screening, secondary metabolites.

SYNTHESIS AND BIOLOGICAL EVALUATION OF PYRAZOLINE DERIVATIVES

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Abstract

Pyrazoline derivatives have garnered significant attention in medicinal chemistry due to their diverse biological activities. This study investigates the synthesis and antifungal/antimicrobial potential of a series of novel pyrazoline derivatives. A range of substituted pyrazolines were synthesized and characterized by characterization techniques ^{1}H NMR, ^{13}C NMR, mass spectrometry . The antifungal and antimicrobial activities of these compounds were evaluated against Candida albicans, Aspergillus niger, Staphylococcus aureus, Escherichia coli using disc diffusion method. Results demonstrated that several synthesized pyrazoline derivatives exhibited significant antifungal and antimicrobial activity showing the most potent effects. These findings suggest, that pyrazoline derivatives represent promising candidates for development of novel antifungal and antimicrobial agents.

Keywords: pyrazoline derivatives, antifungal activity, antimicrobial activity.

REVIEW ON GREEN SYNTHESIS OF NANOPARTICLES: SUSTAINABLE APPROACHES AND APPLICATIONS

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Abstract:

Now a day, nanoparticles being important in a variety of applications that is environmental science, medicine, material engineering, use in battery and

supercapacitor applications. Nanotechnology has become a very important focus area of study. In day-to-day research, conventional synthesis methods frequently use hazardous chemicals and lot of electricity also use, which create lots of problems about sustainability and environmental safety like water pollution, air pollution, soil pollution. By using biological approach including plant extracts, bacteria, fungi and algae, green synthesis of nanoparticles provides a sustainable ecofriendly and environmentally friendly alternative. This review paper focus on the promise of green synthesis as a comparative alternative to traditional chemical and physical methods by study all concepts, methodologies, benefits and different uses.

Keywords: Nanoparticles, engineering Nanotechnology, Green Methods. Fungi.

COMPARATIVE STUDIES OF WATER AND SALINITY STRESS ON MUSTARD AND CORAINDER SEEDS

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Abstract:

The research aimed to explore the germination of seeds and the initial growth of seedlings for coriander and mustard under various stress conditions, particularly focusing on salt and water stress. The findings from the experiment illuminated how both plant species respond to environmental stressors and offered valuable perspectives on potential strategies to alleviate these stresses, thereby enhancing seedling growth and overall crop yield. Salinity and drought are significant stressors that negatively impact plant growth and productivity, making it essential to develop crops that can withstand these challenges. Typically, low temperatures lead to mechanical constraints, while salinity and drought primarily disrupt the ionic and osmotic balance within the cells. It is now well recognized that stress signals are initially detected at the membrane level by receptors, which then transmit these signals within the cell to activate stress-responsive genes that facilitate tolerance. Gaining insights into the mechanisms of stress tolerance, along with the myriad of genes involved in the stress signaling network, is vital for advancing crop improvement. Therefore, to enhance and maintain the productivity of mustard and coriander seeds, it is essential to comprehend and boost their salt tolerance. In this investigation, we analyzed the responses of mustard and coriander to salt stress.

Keywords- Drought, Germination, Salinity, Seedlings.

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING *CUSCUTA CAMPESTRIS* EXTRACT: CHARACTERIZATION AND ANTIMICROBIAL EVALUATION

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Abstract

This study focuses on the eco-friendly synthesis of silver nanoparticles using the extract of *Cuscuta campestris*. The green synthesis method leverages the natural reducing agents in plant extracts, offering a sustainable, eco-friendly and cost-effective alternative to traditional chemical approaches. Characterization of the synthesized nanoparticles was carried out using techniques such as UV-visible

spectroscopy, IR spectroscopy, Energy Dispersive X-ray, SEM, X-ray diffraction (XRD), and transmission electron microscopy (TEM) to analyze their size, shape, and crystalline structure. The antimicrobial activity of the nanoparticles was tested against various pathogenic bacteria and fungi, revealing significant inhibitory effects. The results highlight the potential of *Cuscuta campestris* extract as an effective bioreductant for synthesizing silver nanoparticles with notable antimicrobial properties. This research advances the field of green nanotechnology and encourages further exploration of plant-based synthesis methods for metal nanoparticles.

Keywords: Green synthesis, silver nanoparticles, Cuscuta campestris, characterization, UV-visible spectroscopy, X-ray diffraction (XRD), transmission electron microscopy (TEM), antimicrobial activity, bioreductant, nanotechnology.

BIOCIDAL PROPERTIES OF COPOLYMER DERIVED FROM SULPHANILIC ACID, SEMICARBAZIDE AND FORMALDEHYDE

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Abstract

A new copolymer having biocidal properties (SASF) has been synthesized by the condensation polymerization of sulphanilic acid (SA) and semicarbazide (S) with formaldehyde (F) in the presence of 1M HCl as a catalyst using 3:1:5 molar ratios of reacting monomers. The copolymer was characterized by UV-Visible spectra, Fourier Transform IR, ^{1}H NMR spectra. The number average molecular weight of copolymer was determined by conductometric titration in non-aqueous medium. Viscosity measurement were carried out in DMF indicate normal behavior. Scanning electron microscopy (SEM) and XRD technique were used to elucidate morphology of synthesized copolymer (SASF) . Synthesized polymeric compounds have been screened in vitro against Bacillus subtilis, Staphylococcus aureus (Gram-positive) and Escherichia coli, Salmonella typhi (Gram-negative) using shaking flask method. The entire polymer metal complexes showed excellent anti-bacterial activity and low toxicity when compared with their parental polymeric resin. The antibacterial activity and toxicity of the entire synthesized compound is significant and they can be used as antimicrobial as well as antibacterial agents.

***Keywords*:** Copolymer, Characterization, biocidal property, activation energy.

GROUNDWATER HARDNESS INDUCED HAIR FALL IN CHANDRAPUR DISTRICT, CENTRAL INDIA

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Abstract:

Hard water which comprises calcium, silica and magnesium could make the hair dry and harm them. On an average someone loses 50 to 100 hairs per day. In India, 85 percent of the male population suffers from pattern baldness and 40 percent of the female population suffer from hair fall. This study was attempted with an objective to ascertain the contribution of groundwater hardness to hair fall. A total of 500 individual from rural areas of Chandrapur district were identified as a sample

population. From this sample population, 128 hair fall individuals comprising of different age groups 15-25 (n=42), 26-35 (n=42), and 36-45 (n=44) years were identified to collect the groundwater samples. The groundwater samples were collected in winter season, by grab sampling methods and analysed for various parameters as described in APHA. The pH, conductivity and total dissolved solids were within the permissible limit of the Indian Standards for drinking water. The alkalinity was above the permissible limit (600 mg/L as $CaCO_3$) in some rural area. The total hardness was within the permissible limit (86.71%) in some rural area. The total hardness of water was above the permissible limit (13.28%) in some rural area it may be exposed to groundwater hardness. Calcium and magnesium hardness ratio was found in rural area is minimum value 0.16, maximum value 12.25 and Standard deviation value ±1.43. Hard water contains an excess amount of calcium and magnesium could make the hair dry and breakages it leads to hair thinning and hair fall. Calcium is a main ingredient in hard water settle on the scalp in the form of soap scum. It clogs hair follicles to inhibit the hair growth.

***Keywords*:** Calcium Hardness, Groundwater, Hair fall, Magnesium Hardness.

STUDY OF ICHTHYOFAUNA IN CHORGAO LAKE, CHANDRAPUR, DISTRICT CHANDRAPUR, MAHARASHTRA, INDIA

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Abstract

Chorgaon lake is located in Chandrapur District Maharashtra. The lake is naturally formed depression filled with water and it is used for irrigation, fishery development and Recreation. Many species of fishes found in Chorgao lake. These fishes were collected from local fisherman and the village market. Total 30 species of fishes were identified. The main aim of study is to find out the growth, distribution and quality of Ichthyofauna in lake water which provide food for other water creatures and also the villagers. The present study deals with the diversity of Ichthyofauna found in Chorgaon lake. The lake is rich in Ichthyofauna and shown great diversity.

***Keywords*-** Chorgao, lake, Ichthyofauna and fishes.

STUDY OF VARIOUS PHOTOCHEMICAL SENSORS FOR THE DETECTION OF LITHIUM IONS

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Abstract:

The recent surge in the use of lithium ions for the development of electronic devices, medical applications, and research has drawn significant interest from scientists in the study of lithium ions. Given the unique characteristics of lithium and its successful applications across various domains, it is crucial to investigate the detection and sensing of lithium ions in both biological and chemical contexts. Currently, a variety of sensors are employed for lithium-ion detection, with chemosensors standing out due to their rapid response to light and efficient operation. Compared to other sensor types, chemosensors offer advantages such as cost-

effectiveness, real-time monitoring, and precise optical detection of metal ions. Photochromic and fluorescence compounds utilized as lithium-ion sensors exhibit varying adsorption mechanisms when lithium ions are present. The performance of these sensors is influenced by their distinct chemical structures. The following sections will explore various compounds that possess the dual capabilities of fluorescence emission and lithium-ion adsorption-desorption. Numerous fluorescent chemosensors utilizing naphthalene diimide coumarin, spiropyran and porphyrin molecules have been developed for the selective detection of lithium ions. Here we studied performance of chemosensors by focusing on their structural characteristics.

NANODELIVERY ENHANCES BIOAVAILABILITY OF POLYPHENOLS

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Abstract:

Polyphenols, naturally occurring compounds found in plants, are widely recognized for their health benefits, including antioxidant, anti-inflammatory, and anticancer properties. However, their clinical application is often limited by poor bioavailability, resulting from low solubility, instability in physiological conditions, and rapid metabolism. To address these challenges, nanotechnology-based delivery systems have emerged as a promising strategy to enhance the bioavailability and therapeutic efficacy of polyphenols. This review explores various nanodelivery platforms, such as liposomes, polymeric nanoparticles, solid lipid nanoparticles, and nanoemulsions, which can encapsulate polyphenols, protect them from degradation, and facilitate targeted delivery to specific tissues or cells. These nanocarriers improve the solubility, stability, and controlled release of polyphenols, thereby enhancing their absorption and bioavailability. Furthermore, surface modifications of nanoparticles with ligands or antibodies enable active targeting, increasing the accumulation of polyphenols at the desired site of action. Preclinical studies have demonstrated the potential of nanodelivery systems to improve the pharmacokinetics and pharmacodynamics of polyphenols, paving the way for their broader therapeutic application. However, challenges related to scalability, safety, and regulatory approval remain to be addressed. In conclusion, nanotechnology offers a transformative approach to overcoming the limitations of polyphenol delivery, with significant implications for improving their bioavailability and therapeutic outcomes.

***Keywords*:** polyphenols, bioavailability, nanodelivery, nanoparticles, encapsulation.

SYNTHETIC ORGANIC CHEMISTRY: INNOVATIONS, TECHNIQUES, AND THEIR TRANSFORMATIVE IMPACT ON MODERN SCIENCE

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Abstract:

Synthetic organic chemistry is a cornerstone of modern science, involving the design and construction of complex organic molecules through controlled chemical reactions. This branch of chemistry is central to many fields, including pharmaceuticals, materials science, and agriculture, driving technological

advancements and innovations in various industries. The paper explores the fundamental principles of synthetic organic chemistry, from basic reaction mechanisms to more advanced synthetic strategies such as retrosynthesis and catalytic methods. It delves into the applications of synthetic organic chemistry, including the creation of new drugs, functional materials, and the sustainable practices introduced by green chemistry. Through this discussion, the paper emphasizes the importance of synthetic organic chemistry in shaping modern technology, offering insights into future directions and challenges.

SYNTHESIS AND CHARACTERIZATION OF PYRAZOLES

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Abstract:

This study includes preparation and characterization of the chalcone compound which were prepared from reaction of Aromatic aldehyde and aromatic ketone which is a one-step reaction and also prepared pyrazols compounds from the chalcone derivative with hydrazine All the prepared compounds were Characterized by means of the FT-IR spectra and the proton ^{1}H.NMR spectra. Then the bio-activity of these compounds and their effect on two types of bacteria (staphylococcus, Escherichia coli) were studied some compounds were identified that have a strong inhibitory effect.

Keywords: Green synthesis, Chalcone, Pyrazol.

ADSORPTION OF ARSENIC FROM SALINE POLLUTED WATER FROM MURTIZAPUR REGION, RAJURA-GHATE DAM

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Abstract:

The presented study deal with the adsorption efficacy of heavy metals from the water. To finding the amount how much ppm of As (III) adsorption effectiveness from water, the study assessed the characteristics of the prepared materials and the experimental conditions. The study was optimized the experimental condition with a dosage of 1 g/ L, contact time of 90 min, the solution pH of 8, and the initial concentration of 3-4 ppm of As (III). The optimization was carried out in distilled water and later the experiments were conducted in the real polluted salty water. The physical characteristics were investigated using techniques like X-ray diffraction, Fourier transform infrared spectroscopy. The experimental result shows the adsorption efficiency of 54% of As (III) at the optimized condition during the experimental condition.

A SURVEY ON BIG DATA ANALYTICS: CONCEPT, APPLICATIONS, CHALLENGES AND BIG DATA MANAGEMENT TOOLS & TECHNOLOGIES

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Abstract:

In the digital era, A huge repository of terabytes of data is generated each day from modern information system and digital technologies such as internet of things ,cloud computing ,internet application and mobile application. That technologies and applications produce extremely large and diverse collection of structured, unstructured or semi structured data that continues to grow exponentially over time. Around the world various locating sensors are collecting and transmitting data that will be stored and processed in the cloud. Analysis of these massive data requires a lot of efforts at various levels to extract knowledge for decision making. Therefore, big data analysis is a current research and development area for new researchers.

In this paper, first write an introduction of big data, explained it's features then examine the applications of big data in different fields and the challenges facing it are discussed. Finally, technologies related to big data in the field of big data analysis, data storage technologies, and visualization tools are proposed for cloud computing, IoT and data center are examined new technologies that are closely related to big data.

The main aim of writing this paper is to explore the potential impact of big data challenges, open research issues, and various tools associated with it. As a result, this paper provides a new platform to explore big data at numerous stages and it opens a new horizon for researchers to develop the solution, based on the challenges and open

***Keywords*:** Big data analytics, Massive data Structured data, Unstructured Data.

SUSTAINABLE PEST MANAGEMENT: AN EVIDENCE-BASED ANALYSIS OF MODERN BIOPESTICIDE STRATEGIES

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Abstract:

Evidence-based analysis of modern biopesticide strategies within the framework of sustainable pest management is studied. Findings from recent research, technological innovations, and market trends to provide a comprehensive understanding of how biopesticides are reshaping agricultural practices have been considedered. The analysis evaluates the efficacy and environmental benefits of biopesticides, focusing on both microbial agents and botanical extracts as viable alternatives to conventional chemical pesticides. Advances in formulation technologies, including microencapsulation and nanotechnology, are examined for their role in enhancing the stability, targeted delivery, and overall performance of these biological agents.The insights provided here aim to guide future innovations and improved implementation strategies in the global pursuit of sustainable pest management.

***Keywords*:** Biopesticides, Sustainable Pest Management, Integrated Pest Management (IPM), Microencapsulation, Nanotechnology.

SYNTHESIS, CHARACTERIZATION AND ANTIBACTERIAL ACTIVITIES OF PYRIMIDINE HETEROCYCLE DERIVATIVES FROM CHALCONES

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Abstract:

Pyrimidine heterocyclic compounds possess in their structures an unsaturated-six-membered ring with two nitrogen atoms located at the first and the third locations of the ring. The derivatives of pyrimidine play a significant role in medicinal chemistry as it is reported that they exhibit a wide range of biological activities, In this study, chalcones was prepared from reaction of 2/4-hydroxy acetophenone with different aldehydes in a basic medium (NaOH), then new pyrimidine derivatives were synthesized from reaction of prepared hydroxychalcones with urea /thiourea, the characterization of synthesized pyrimidine derivatives was confirmed by the IR, ^{1}H-NMR and mass spectral analysis. All these newly synthesized compounds were evaluated for their antibacterial activity against four different pathogens such as *Escherichia coli, Salmonella typhi, Staphylococcus aureus* and *Bacillus subtilis* using Penicillin and Greseofulvin.

***Keywords*:** Hydroxyl chalcones, Urea/Thiourea, Pyrimidines, Antibacterial activity

SYNTHESIS, CHARACTERIZATION, AND ANTICANCER EVALUATION OF 1,2,4-TRIAZOLO[4,3-B]PYRIDAZINE DERIVATIVES

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Abstract:

The 1,2,4-triazolo[4,3-b]pyridazine scaffold has been recognized as a promising framework with potential anticancer activity, as supported by previous studies. Building on this background, we designed a series of 1,2,4-triazolo[4,3-b]pyridazine derivatives to investigate their structure-activity relationship (SAR) and optimize their anticancer properties. The target compounds were synthesized through oxidative cyclization of various 3-((2-substituted arylidene)hydrazinyl)-6-phenylpyridazines using a hypervalent iodine reagent, iodobenzene diacetate (IBD) in aqueous media at ambient temperature for 2-3 h. In total, we have synthesized 15 derivatives of 3-aryl-6-(phenyl)-[1,2,4]triazolo[4,3-b]pyridazine in excellent yield and their structure was confirmed by their characterization data-^{1}H NMR, ^{13}C NMR, Mass-spectrometry and FTIR. Their biological activities were predicted using the PASS online tool, which indicated potential anticancer properties. To further assess their efficacy, the synthesized triazoles were evaluated for anticancer activity against the MCF-7 breast cancer cell line. Additionally, molecular docking studies were performed to analyze their interactions at the adriamycin binding site of the quinone reductase 2 (PDB: 4ZVM) protein.

***Keywords*:** 1,2,4-Triazole; MCF-7 Cell Line; Hypervalent Iodine Reagents; Anti-cancer Activity; Aqueous medium; IBD

HIGHLY SELECTIVE AND SENSITIVE DETECTION OF IRON FROM BENZOTHIENO[C]QUINOLINE BASED A NOVEL FLUORESCENT RECEPTOR "TURN-ON" FROM AQUEOUS SOLUTION

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Abstract:

New 6-(thiophen-2-yl)benzo[4,5]thieno[3,2-c]quinoline (QTP)) was synthesized through a simple synthetic route and has been synthesized and characterized with spectroscopic methods, and DFT. The 1:1 binding stoichiometry of probe QTP and Fe^{3+} ions were proposed by DFT calculations and confirmed by the mass spectrum of receptor QTP.Fe^{3+} complex. This receptor establishes excellent fluorescent sensing abilities with distinguished discrimination for Fe^{3+} over other metal ion with lower detection limit 6.37 µM. The projected method is modest, cheap, fast, sensitive, and highly selective, and can be used to control Fe(III) contents in aqueous solution and applicable in live cell image study.

STANDARDIZATION AND PHYTOCHEMICAL IDENTIFICATION OF CHLOROPHYTUM BORIVILIANUM FOR PREPARATION OF MICROSPONGES

Abstract:

Safed Musli, also known as Chlorophytum borivilianum, is a medicinal plant that is well-known for its immunomodulatory, aphrodisiac, adaptogenic, pharmacological and therapeutic qualities. The standardization and phytochemical identification of Chlorophytum borivilianum in preparation for its integration into microsponge formulations are the main objectives of this work. Advanced Amalgamation analytical techniques were used to analyse the bioactive compounds found in the plant's roots, and the results confirmed that the main ingredients were flavonoids, alkaloids, and saponins. To guarantee the uniformity and quality of the plant material, standardization was carried out using physicochemical, chromatographic, and organoleptic techniques. Their pharmacological potential depends on the existence of bioactive components such as Glycosides, Alkaloids, flavonoids, phenolics, and steroidal saponins, which were identified by preliminary phytochemical screening. Because of these chemicals' well-known adaptogenic, anti-inflammatory, and antioxidant qualities, the plant is a great choice for medicinal uses. Using Eudragit RS 100 as the polymer, the microsponge formulation was created via the quasi-emulsion solvent diffusion process. The microsponges' spherical shape, homogeneous particle size distribution, and excellent entrapment effectiveness were all discovered during characterization. Chemical stability was guaranteed by Fourier-transform infrared spectroscopy (FTIR) analysis, and in vitro release experiments showed a sustained release of phytochemicals over a 12-hour period, greatly increasing the bioavailability in comparison to traditional formulations. By allowing for controlled and sustained release, the incorporation of Chlorophytum borivilianum into a microsponge delivery system maximises the therapeutic efficiency of its active ingredients while also maintaining their stability. This study highlights the potential of

fusing advanced drug delivery technologies with conventional herbal remedies. The study emphasizes microsponges as a workable way to improve the therapeutic utility of Chlorophytum borivilianum by tackling important issues including poor solubility and quick degradation of bioactive chemicals. Clinical investigations to confirm the safety and effectiveness of the microsponge formulations are one area of future study that will open the door to creative methods to herbal medicine delivery systems.

***Keywords*:** Chlorophytum borivilianum, Standardization, Safed musli.

EXPLORING THE VERSATILITY OF TERPOLYMERS: SYNTHESIS, PROPERTIES, AND CHARACTERIZATION

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Abstract:

Salicylic acid, furfural, and Pyrogallol monomers were combined in a different molar ratio using the Polycondensation process. 2M HCl was used as a catalyst, and the mixture was refluxed for 5 hours at 120C's. The compositions of terpolymers have been further characterized by elemental analysis. The UV-visible spectral studies, infrared (FTIR) spectra, and proton NMR spectra used to characterize the copolymer. The molecular weight of the copolymer have been determined by using Gel permission chromatography (GPC) method. Scanning electron microscopy (SEM) was used to examine the terpolymer's morphology, revealing that it is semi-crystalline. The synthesized terpolymer's percentage yield is found to be 70.44%. The terpolymer is found to soluble in DMF, DMSO, THF and almost insoluble in all common organic solvents.

Keywords: Synthesis, Morphology, SEM, Semi-crystalline, Polycondensation.

CELLULOSE BASED GREEN SULPHONATED CATALYST: A BIO-WASTE HETEROGENEOUS CATALYST FOR SUSTAINABLE SYNTHESIS OF ACRYLIDENE MALONONITRILE

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Abstract:

The investigation of organic synthesis with bio-waste materials has emerged as a high researched field owing to its environmentally benign methodology. The current work presents the Cellulose based green sulphonated catalyst as a reusable and green catalyst for the efficient synthesis of the acrylidene malononitrile derivatives, thus forming C–C bonds via Knoevenagel condensation reaction. The catalyst underwent further characterization using several techniques such as Fourier-transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), energy-dispersive X-ray (EDX), and high-resolution transmission electron microscopy (HR-TEM) methods. The presence of basic sites in WEWAA promotes its use as a catalyst in the synthesis of acrylidene malononitrile derivatives. The isolated product did not necessitate any column chromatographic purification and was recrystallized using hot ethanol. A total of nine derivatives were

synthesized rapidly at room temperature within 2–15 min, yielding an excellent range of 89–94% and subsequently verified using nuclear magnetic resonance (NMR) and Fourier-transform infrared (FT-IR) spectroscopic techniques. In addition, the catalyst can be reused for up to four cycles with its efficiency being 90%, 88%, 81%, and 70% in 1st, 2nd, 3rd, and 4th cycle.

Keywords: MCRs, Bioresource based, Green Approach, Water Extract of Wood.

OPTIMIZING STRUCTURAL AND ELECTRICAL PROPERTIES OF ZNO/PS AND ZNO/LDPE THIN FILMS WITH ZNO NPS

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Abstract:

Polymer-inorganic nanocomposite (PINC) thin films were fabricated using the solution casting technique, incorporating Zinc Oxide nanoparticles (ZnO NPs) as fillers in varying weight percentages (0, 0.5, 1, 3, 5) into two polymer matrices—Polystyrene (PS) and Low-Density Polyethylene (LDPE). The structural and chemical properties of the ZnO/LDPE nanocomposite thin films were characterized using X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), and Fourier-transform Infrared spectroscopy (FTIR). The DC electrical conductivity of ZnO/PS and ZnO/LDPE nanocomposites was analyzed as a function of filler concentration. In both PINC systems, conductivity exhibited an increasing trend with higher ZnO NP loading. Notably, ZnO NPs demonstrated a more pronounced enhancement in the electrical conductivity of PS compared to LDPE.

***Keywords*:** ZnO NPs, PS, LDPE, PINCs, DC Electrical Conductivity.

COMPARATIVE STUDY OF CZTS AND CZFS THIN FILM BY CHEMICAL ROUTE SYNTHESIS FOR DIVERSE APPLICATIONS

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Abstract:

This study compares the potential applications of CZTS (Copper Zinc Tin Sulfide) and CZFS (Copper Zinc Tin Fluoride) in various fields, including solar cells, gas sensors, photosensors, and supercapacitors. Both material synthesis by Chemical bath deposition method and share an optical bandgap of approximately 1.4-1.8 eV, is well-suited for solar cell applications due to its non-toxicity and optimal bandgap for photovoltaic conversion. In contrast, CZFS, with its potential for a similar bandgap, could offer unique advantages in gas sensing and photo-sensing due to its possible higher sensitivity and stability. Theoretical replacement of tin with iron in CZFS might introduce ferromagnetic properties, expanding its applications. Both materials exhibit porous and uniform morphology, which enhances their ability to trap sunlight and increase conductivity. This comparative analysis aims to explore the theoretical and practical advantages of each material across these applications, highlighting opportunities for optimization and innovation in renewable energy and sensing technologies.

POTENTIAL ADSORBENTS FOR REMOVAL OF WATER HARDNESS USING CHEMICALLY ACTIVATED CARBONS FROM CASUARINA CUNNINGHAMIANA MIQ

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Abstract

In the present work low cost and having no commercial value biomass Casuarina Cunninghamiana Miq and its different parts has been used as raw material in the preparation of activated carbons by using $ZnCl_2$ activating agent at different temperatures 400°C and 500°C. Three water samples waste water, well water and tap water from Malkapur District Buldhana, Maharashtra were used for the hardness removal tendency. The experimental results reveal that activated carbons are more suitable as compare to carbonized carbon samples and provides more porosity and surface area for removal ions which are responsible for water hardness. Highest hardness removal tendency 85.00% shown by activated carbon of cone sample at 500°C against tap water followed by activated carbon of leaves sample shows 69.69% at 400°C against well water which further followed by carbonized carbon of stem sample shows 68.05%. And these three samples were found to be good adsorbents as compare to other adsorbents.

Keywords: Activated carbon, Casuarina Cunninghamiana Miq, Water hardness.

DESIGN OF TEXTILE ANTENNAS AND SENSORS FOR WEARABLE APPLICATIONS A DEVICE THAT MEASURES AND ANALYZES THE PERFORMANCE OF THE PHYSICAL ENVIRONMENT

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Abstract:

Wearable devices' lightweight, flexible, and user-friendly designs are popular in healthcare, sports, and environmental monitoring. Clothes with modest textile antennae and sensors monitor the surroundings and body in real time. This project develops textile-based antennas and sensors for wearable applications, focusing on performance, durability, and wireless communication system integration. The proposed device employs conductive textiles and advanced materials for flexibility, breathability, and garment compatibility. Sensors measure air quality, temperature, humidity, heart rate, and body temperature. Data is processed and visualized in real time using IoT systems. The study evaluates textile antenna bandwidth, efficiency, radiation patterns, and signal integrity under deformation and washing. This research enables scalable environmental awareness and health monitoring in networked societies, advancing smart textiles. Modern buyers desire portable, lightweight goods. This and customer demand led to the creation of a broadband flexible antenna for a variety of wireless applications and low-power IoT devices on a flexible substrate. The antenna can be installed on a flexible substrate. A tiny antenna operates at 3.15-8.96 GHz. Its frequency range is vast. For 4.14 GHz resonance, the antenna is

developed. Simulations show the antenna's maximum directivity is 2.853 dBi. Present antenna has 96.03% broadband width. The projected antenna's low profile is perfect for IoT applications.

***Keywords*:** Sensors integrated, physical environment, Jeans Material, Flexible.

STUDIES ON PHYTOCHEMISTRY AND ANTIMICROBIAL ACTIVITY OF *IPOMOEA PES-CARPAE* (L.) R. BR. (CONVOLVULACEAE) FROM MAHARASHTRA STATE

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Abstract

Leaves of *Ipomoea pes-carpae*are (L.) R. Br useful in the treatment of arthritis, fatigue, strain, rheumatism, it is also used as anti-heamolytic, anti-inflammatory, antispasmodic, anticancer activities and skin diseases, to treat diarrhoea, vomiting and piles. In present study antibacterial and phytochemical properties of ethanolic leaf extract of *Ipomoea pes-carpae*are. The antimicrobial properties were assayed *in vitro* against *Pseudomonas aeruginosa, Salmonella typhi, Staphylococcus aureus, Escherichia coli* and *Shigella flexneri* by 96 well-plate method. Leaves extract shown maximum inhibition and minimum inhibitory concentration (MIC) for *S. flexneri* and *P. aeruginosa* (2 µl), *S. typhi* and *E. coli* (6 µl) and *S. arueus* (8 µl). Various phytochemical tests of leaf extract revealed presence of steroid, glycoside, flavonoid, tannin, phenol, terpenoids, phytosterol and saponin. The antibacterial activityof leaves may due to presence of secondary metabolites in it. Pharmacognostic standardization will be helpful in developing standards for purity, quality and identification of the crude drugs.

***Keywords*:** *Ipomoea pes-carpae*are, leaf extract, antibacterial, phytochemical.

PREPARATION, CHARACTERIZATION AND GAS SENSING PROPERTIES OF SPINEL COPPER CHROMITE NANOPARTICLES VIA SOL-GEL METHOD

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Abstract:

The ability of semiconductor gas sensors to differentiate between gases is essential but difficult to obtain. In this study, spinel $CuCr_2O_4$ was made to be CO selective and the possible mechanism for the selectivity was studied. The synthesis of $CuCr_2O_4$ was carried out by sol-gel method. Phase composition was confirmed via X – ray diffraction. An orthorhombic structural phase was observed for $CuCr_2O_4$ nanoparticles. Particle growth during calcination of the nanoparticles at different

temperatures (650^0C, 750^0C, 850^0C) was measured by scanning electron microscopy. The gas-sensing properties of $CuCr_2O_4$ were also investigated using different reducing gases. The excellent selectivity of $CuCr_2O_4$-based materials for CO gas was explained by the mechanisms of CO.

Keywords: Copper chromite spinel, sol-gel, XRD, gas sensor, selectivity.

MYCORRHIZAL BIODIVERSITY ASSOCIATED WITH *ANNONA SQUAMOSA* L. AT ACHALPUR REGION OF AMRAVATI DISTRICT, MAHARASHTRA

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Abstract:

AM-Fungi are ubiquitous and form a mutuality relationship with roots of most plant species. Generally, the distribution of AM spores in rhizosphere soil is governed by edaphic and certain climatic factors. Use of bio fertilizers in the soil, makes the plants healthy as well as protect them from the pathogenic organisms of environment. The importance of these fungi to agricultural and forestry resides in their role in plant growth and nutrition. Nearly 80% of land plants have symbiotic mycorrhizal association. AMF offers an alternate supply of minerals and other nutrients, including phosphorus.

In present study, investigation of diversity of arbuscular mycorrhizal fungal spores present in rhizospheric soil. Total nine (9) rhizospheric soil samples of *Annona squamosa* L. in different villages of tehsil Achalpur, of district Amravati, Maharashtra, India were collected. Isolation of spore population by wet sieving and decanting method and slides were prepared in PVL (polyvinyl lactic acid) as a mounting medium and this allows the slides remain observable. Later on, all such slides observed carefully under binocular stereoscopic microscope. Identification and analysis of rhizospheric soil samples resulted that, several species were found in nine (9) rhizospheric soil samples of Achalpur tehsil. Species of *Glomus* and *Gigaspora* was dominating in all soil samples of field *Annona squamosa* L. Along with these, *Acullospora*, were also found in good number. The Genus *Glomus* was distributed in large number among the 9 rhizospheric soil sample.

***Keywords*:** Arbuscular Mycorrhizal Fungi (AMF), Annona squamosa L., rhizosphere.

STRUCTURAL ANALYSIS OF ROOT AND WOOD VESSELS IN CASSIA FISTULA L

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Abstract:

In this present study structure of the root and Wood vessels of *Cassia fistula* studied in detailed. This shows secondarily formed root vessels are predominantly circular broder, solitary and few in groups with simple perforation plates, lateral walls with simple circular pits. Wood Vessels cylindrical to triangular, predominantly longer

than broad at one or both ends. Perforation plates commonly 2- per vessels, simple, present on almost transverse or slight inclined end walls, triangular and circular in shape as broad as end walls termination horizontal and tapering without or with short ligule at one or both ends. Occasionally short vessels with perforation on lateral wall noticed. Sculpturing pattern on lateral walls pitting, pit simple, uniformly crowded, elliptic in outline, vary in size small to medium sized, arrangement alternate or irregular in many rows. The present investigations found as significant contribution regarding detailed anatomical information about root and wood vessels can help the systematics and also taxonomists for interpreting phylogeny and relationship of the taxa.

Keywords: - Cassia, Vessels, Root, Wood, Perforation plates, Sculpturing pattern, Pitting, Taxonomy, Phylogeny.

DEVELOPMENT OF ORGANIC-INORGANIC NANOCOMPOSITE FOR REAL VAPOR SENSOR APPLICATION

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Abstract:

This study aims to use the conductivity of a synthetic polymer as the sensing probe for ethanol. In order to enhance the sensitivity of the sensor, a composite of the polymer and nickel oxide (NiO) nanoparticles was formed as it improved the conductivity. This composite exhibited 100 times more conductivity than the neat polymer. The semiconductive nanocomposite of poly [N1,N4-bis(thiophen-2-ylmethylene)benzene-1,4-diamine]-nickel oxide (PBTMBDA-NiO) was prepared by in situ chemical oxidative polymerization. The composite was formed by in-situ chemical oxidative polymerization. The molecular structure of BTMBDA and PBTMBDA were confirmed by nuclear magnetic resonance (NMR) (^{1}H, ^{13}C, and Dept-90^{o}), Fourier transform infrared spectroscopy, and ultraviolet (UV)–visible spectroscopy. The PBTMBDA and PBTMBDA-NiO nanocomposite were characterized by X-ray diffraction, thermogravimetric analysis, field emission scanning electron microscopy, and energy-dispersive X-ray spectroscopy analysis. The results of characterization studies indicate the strong interaction between PBTMBDA and NiO in the nanocomposite. The broadness of ^{1}H NMR peaks in PBTMBDA was due to the increased number of monomer units. The disappearance of the peak of a-hydrogens on thiophene confirms the polymerization involving the fifth position of thiophene part of BTMBDA. The Fourier transform infrared spectroscopy spectra revealed that position of the characteristic peaks of the functional groups in the monomer shifted toward lower wave numbers in PBTMBDA and PBTMBDA-NiO nanocomposite. This shifting confirms the presence of extended conjugation along the polymer backbone. The X-ray diffraction plots showed that the characteristic peak of NiO in PBTMBDA-NiO nanocomposite suggested successful incorporation of NiO in PBTMBDA-NiO nanocomposite. The thermogravimetric analysis revealed the improved thermal stability of the composite. Field emission scanning electron microscopy and energy-dispersive X-ray spectroscopy analysis confirmed the presence of the NiO in the composite. Incorporation of nickel oxide nanoparticles improved the electrical conductivity and stability of PBTMBDA. The nanocomposite was found to be thermally more stable than PBTMBDA and exhibited

better direct-current electrical conductivity and isothermal stability than the PBTMBDA as revealed by the four-probe study. The electrical conductivity as inferred from the four-probe method was used as the parameter to study the isothermal stability of the composite. The PBTMBDA-NiO nanocomposite-based vapor sensor was constructed for the sensing of ethanol vapor in commercial ethanol and real samples (alcoholic drinks: Beer, Wine, Brandy, Vodka, Whisky, and Rum) It was observed that on exposure to ethanol vapor at ambient temperature, the electrical resistivity of the nanocomposite increased indicating suppression of charge carriers. The interaction of ethanol vapor with PBTMBDA in PBTMBDA-NiO nanocomposite was confirmed by IR spectral technique. The change in the structure of the PBTMBDA on interaction with ethanol was highlighted by the changes in the infrared spectrum. The conductivity of the polymer was explained using the structure-activity relationship of the monomer evaluated using Gaussian 09 software. This study also analyzed the total electron density with electrostatic potential of the monomer and its correlation with chemical reactivity in order to explain the ethanol vapor sensing-property of the nanocomposite.

***Keywords*:** Conducting polymers, sensors and actuators, structure-property.

THE NEED OF WATER AWARENESS IN WATER CONSERVATION AT CHIKHALDARA, DISTRICT AMRAVATI MAHARASHTRA

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Abstract

Chikhaldara is a well-known hill station located in the Amravati district of Maharashtra, which is situated approximately 1,100 meters (3,600 feet) above sea level in the Satpura Range of the Western Ghats**.** It is known for its dense forests, rolling hills, variety of flora and fauna, valleys and Melghat Tiger Reserve. **G**eologically, **t**his region's shows various geological features, basaltic nature of rock, various topography, and soil types. In this region, the only major source of water is seasonal rainfall from the monsoon with rivers and streams feeding into nearby reservoirs and lakes. However, during the dry months, water scarcity can become an issue, for particularly tourism and agriculture purpose.

In the present study, the awareness camping has been carried out in chikhaldara village during last year and it is observed that, most of the villager has less aware about water conservation and its technique. Water awareness in the Chikhaldara region can significantly improve the management and conservation of water resources. By educating the local population, tourists, and farmers about sustainable practices, water-saving technologies, and the importance of preserving water bodies, the region can address water scarcity issues and create a more water-resilient community. Active participation from all stakeholders—government, local communities, and tourists—will be essential to achieving long-term water sustainability in the region.

SYNTHESIS AND INVESTIGATION OF GRAPHENE OXIDE FOR SCHOTTKY DIODE APPLICATIONS

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Abstract:

Graphene oxide (GO) was synthesized using a modified Hummers method and characterized structurally and optically using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and diffuse reflectance spectroscopy (DRS). XRD analysis confirmed the presence of a (001) plane with an interplanar spacing of 0.807 nm. FTIR spectra revealed characteristic functional groups, including epoxy, carbonyl, and carboxyl groups. The DRS analysis determined the optical band gap of GO to be 4.3 eV. The synthesized GO exhibits potential applications in Schottky diode sensors and biomedical devices.

***Keywords*:** Graphene oxide (GO), FTIR, UV-visible, Schottky Diode XRD.

GREEN SYNTHESIS OF CELLULOSE NANOCRYSTAL-REINFORCED BIOPOLYMER COMPOSITES FOR SUSTAINABLE PACKAGING

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Abstract:

Growing environmental concerns about plastic waste have sped up the packaging industry's search for sustainable substitutes. This study focuses on the environmentally friendly synthesis of biopolymer composites reinforced with cellulose nanocrystals (CNC) as a packaging material. CNCs were recovered from agricultural waste in an environmentally friendly manner, guaranteeing low energy and chemical waste. The mechanical strength, thermal stability, and barrier qualities of a biodegradable polymer matrix were then improved by incorporating these nanocrystals into it. X-ray diffraction (XRD), scanning electron microscopy (SEM), thermogravimetric analysis (TGA), and Fourier-transform infrared spectroscopy (FTIR) were used to assess the structural, morphological, and thermal characteristics of the resultant nanocomposites. The study found that adding CNC greatly increased the biopolymer's mechanical strength and water resistance, enabling it to be used in environmentally friendly packaging. The biodegradability studies further validated the material's environmentally favorable properties. This study shows how CNC-reinforced biopolymer composites can be a creative substitute for traditional plastic packaging and provide a long-term solution to the plastic pollution problem. Because it guarantees an ecologically conscious production process, the green synthesis approach is a good choice for large-scale industrial applications. For these composites to be used commercially, more study is required to improve their functional qualities and optimize processing methods.

***Keywords*:** Green Synthesis, Biopolymer Composites, X-ray diffraction, scanning electron microscopy, Fourier-transform infrared spectroscopy

GC-MS PHYTOCHEMICAL PROFILING OF MORINGA OLEIFERA AND MUCUNA PRURIENS LEAF EXTRACTS FOR REVEALING THEIR ANTI-OXIDANT ACTIVITY

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Abstract:

Mucuna pruriens and Moringa oleifera commonly known as velvet beans and drumstick plant belong to fabaceae and moringaceae family respectively. Both these plant seed extracts are studied and researched for their medicinal properties. Purposely in the current research work, leaves are used for preparation of extracts because of their availability in abundance and lot of aspects which are still to be discovered. Gas Chromatography-Mass Spectrometry (GC-MS) is a well-known green chemistry technique as there is lesser solvent consumption for analysis of volatile organics with the help of library.Library searchable spectra make it promising for phytochemical profiling ultimately generating the plant fingerprint. Such efficient use of analytical techniques in the world of Natural Therapeutics for revealing phytopharmaceutical aspect of plants is considered to be sustainable & eco-friendly approach. Some of the novel components like Amyrins, Lupeol and Sitosterol from the said plants having significant medicinal & pharmacological activity are reported in the current research. The extracts were then subjected to evaluation of Anti-oxidant activity by two different methods. All these reported components are showing high free radical scavenging activity which can be miraculous for possessing high pharmacotherapeutic value against multiple disorders.

Keywords: Phytochemical profiling, GC-MS, Therapeutics, Anti-oxidant activity.

HETEROCYCLIC SUBSTITUTED PYRAZOLE SYNTHESIS, CHARACTERIZATION, AND POSSIBLE ANTIMICROBIAL PROPERTIES

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Abstract

Heterocyclic substituted derivatives of pyrazoles are regarded as significant and pharmacologically active substances that exhibit nearly every other kind of pharmacological characteristic.All of these synthetic variants demonstrate that the pyrazole moiety is the pharmacological agent's nucleus. For instance, the pharmaceutical potential of pyrazole functionality has been demonstrated in numerous therapeutic types, including betazole, an analgesic, anti-inflammatory, anti-obesity, anti-depressant, and antippsychotic medications. Therefore, because of this diversity in the biological and pharmacological fields. Many scientists and researchers were drawn to these pyrazole moieties in order to investigate their structure both chemically and physiologically. According to the literature, pyrazoles and their derivatives can be synthesized using a variety of techniques. In this study, we have synthesized several derivatives of heterocyclic substituted pyrazoles. And 1H NMR verified its structural analysis.

***Keywords*:** Heterocyclic Compounds, Substituted Pyrazoles, Pharmaceuticals.

STUDY OF EFFECT OF COMPOSITION PARAMETER ON OPTICAL BAND GAP OF SPRAY PYROLYTICALLY DEPOSITED CDZNSE$_{2x}$TE$_{2(1-x)}$ THIN FILMS AT SUBSTRATE TEMPERATURE 275^0 C FOR x= 0 TO 1

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Abstract:

Polycrystalline semiconducting thin films of $CdZnSe_{2X}Te_{2(1-X)}$ were prepared on large area of glass substrate by spray pyrolysis technique. Thin films of $CdZnSe_{2X}Te_{2(1-X)}$ for composition parameter x = 0 to 1 deposited at substrate temperatures 275°C were investigated. Absorption coefficients for the films were evaluated from optical transmission spectra in the wavelength range 350 nm-1100 nm. Composition was confirmed from EDAX. Graphs plotted between $(\alpha h\nu)^2$ and $(h\nu)$ yields straight lines indicating direct transition with optical band gap energies in the range 2.06eV to 2.54 eV for x=0 to 1 at substrate temperature 275°C . Optical properties such as extinction coefficient, refractive index and dielectric constant have been evaluated in wavelength range 350nm-1100nm. Electrical study was carried out by four probe method. Arrhenius behaviour showed semiconducting nature of the films. Direct conversion of solar energy into electrical energy is possible in a solar cell. In remote inaccessible areas and in space energy systems, solar cell technology plays an immediate and important role. The ideal band gaps for optimum efficiency in a tandem structure are about 1.9 eV for the bottom cell and 2.5 eV for the top cell. Since about two thirds of the output comes from the top cell in a tandem structure, this requires a top cell efficiency of 16 – 18%. Therefore $CdZnSe_{2X}Te_{2(1-X)}$ thin films with x=0 to 1 having band gap energies of 2.06 eV and 2.54 eV are most suited for its applications as solar cells and other scientific and technical applications too.

Keywords: Thin films, Spray Pyrolysis, absorption coefficients, Optical Constants.

GRAPHENE OXIDE AND GROWING EXIGENCY

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Abstract:

The Nanotechnology is on rise due to its larger and effective application. Nano material synthesis and characterisations are attracting the interest of researchers. One of such high in demand nanoparticle is Graphene, a 2-dimensional carbon material. Known for its exceptional properties, the application of Graphene is increasing exponentially. Graphene is conveniently synthesised using reduction path of graphene oxide. Graphene oxide (GO) a derivative of graphene has similar properties and application as that of Graphene. The hydroxy, oxygen and carboxylic groups are responsible for variation in thermal, mechanical and electrical properties of GO. As nano materials are intensively studied due to their small yet effective size and formulation, GO has remarkable properties of adsorption and alteration. In account of all these properties, GO is highly applicable in membrane technology, drug delivery, electrochemical sensors and as a source of energy.

A CRUCIAL REVIEW ON TOXICOLOGY STUDIES OF MONPS FOR ITS SUSTAINABLE APPLICATIONS

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Abstract:

Metal oxide nanoparticles (MONPs) have gained attention due to its widespread applications in material science and technological development in the field of catalysis, sensor, capacitors, semiconductor, optoelectronics, ceramics etc. Therefore, it is imperative to keep eye on its ill effects, potential health hazards and environmental toxicity, so that it can remain important tool for sustainable development. Study on fate and toxicity of various nanomaterials, including MONPs like Titanium Dioxide (TiO_2), Zinc Oxide (ZnO), and Cerium Dioxide (CeO_2) based on pH, natural organic matter, and ionic strength influence the behavior and potential risks of these nanoparticles. Research demonstrated that TiO_2 nanoparticles are phototoxic to marine phytoplankton, highlighting the ecological concerns associated with their release into aquatic environments. The field of nanotoxicology delves into the mechanisms through which nanoparticles exert toxic effects. Studies have shown that MONPs can induce oxidative stress by generating reactive oxygen species (ROS), leading to cellular damage. Research indicates that copper oxide nanoparticles can reduce cell viability by up to 60%, primarily due to interactions with cell membranes and the induction of apoptosis. Indium Tin Oxide (ITO) commonly used in electronic applications, has been linked to respiratory issues upon inhalation. Long-term exposure can lead to conditions such as benign pneumoconiosis. Workers involved in the production and reclamation of ITO have reported symptoms ranging from interstitial pneumonia to granulomas, underscoring the need for stringent safety measures in occupational settings. While TiO_2 is prevalent in various consumer products, its nanoscale form has raised health concerns. Inhalation of TiO_2 nanoparticles has been classified by the International Agency for Research on Cancer (IARC) as a Group 2B carcinogen, suggesting a potential risk to humans. This review has undertaken the task of stressing importance of continued research into the toxicological profiles of MONPs. Understanding their interactions with biological systems and the environment is crucial for us to developing newer environmental benign methods of synthesis, ways of application with its minimal use and monitoring its toxic effects. Key words: MONPs, nanotoxicology, reactive oxygen.

BASE MEDIATED SYNTHESIS OF [1,1'-BIPHENYL]-4-CARBONITRILE COMPOUNDS

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Abstract:

Newer, simple and efficient synthesis of [1,1'-biphenyl]-4-carbonitrile derivatives using ring transformation strategy. The synthesized products are characterized by spectral analysis, fluorescence emission and absorption measurements were studied in various solvents having varying polarity and dielectric

constants to find out a change in dipole moment in ground state and excited state of derivatives. Lippert–Mataga plots were utilized to know the effect of solvent polarity on spectral behaviour of molecules. The position of the Stokes shifts were found to be depends on specific solute–solvent interactions, playing a vital role in electronic excitation of molecules. A rational relationship is examined between fluorescence quantum efficiencies and calculated HOMO and LUMO energies by DFT calculations. The electrochemical investigation of derivatives was performed.

Keywords: Base promoted, Ring transformation reaction, Stokes shift, DFT.

SYNTHESIS AND APPLICATIONS OF METAL OXIDES NANOPARTICLES AS SENSORS

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Abstract:

Nowadays nanomaterial plays vital role in different fields of automotive industries, medicine, environmental remedy, energy generation, catalysis, polymers. Versatile properties of metal oxide like electrochromic, photoelectrical, electrolytic and charge storage abilities attracted researchers to find out excellent gas sensors. Numerous metal oxide nanoparticles as ZnO, WO_3, TiO_2 and SnO_2 sensing different toxic gases. Gas sensing mechanism is mainly related to surface reactions. Various methods are used to synthesized nanoparticles like physical methods, chemical methods and mechanical methods among these chemical methods such as sol gel, colloidal and ion exchange method are used. Metal oxides are usually used in both laboratories and industries due to the flexibility to control structure and morphology of the oxide. Increasing pollution causes several effects on environment, to regulate harmful gases such as CO_2, NO_x, H_2S and CO etc its essential to monitor for awareness and control. Metal oxides are active materials assure fast response, high sensitivity, selectivity towards gases, thermal stability for detection of different gases. Most of the metal oxide gas sensors are made up of low-cost materials by screen printing on suitable thin ceramic substrate.

PREPARATION OF COMPOSITE FROM BARK OF INDIAN BLACKBERRY PLANT, CHITOSAN AND COTTON SEED COAT FOR EFFICIENT ADSORPTION OF ORGANIC DYES AND HEAVY METAL TO TREAT WASTE AND POLLUTED WATER

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Abstract:

The increasing contamination of water bodies by pollutants such as heavy metals, organic dyes, pharmaceutical waste has raised concerns over environmental and human health impacts. The main aim of this study is the preparation of a bio-waste based composite material from biological waste material and it's use for better improvement in water pollution. A composite material was prepared by combining cotton seed coat, blackberry plant bark and chitosan, which were selected for their high cellulose and lignin content as well as their adsorptive properties.

The composite were synthesized using a simple blending method followed by drying. The adsorption capacity of the composite were evaluated for the removal of heavy metals and dyes under varying condition of pH ,contact time, varying concentration of adsorbent and adsorbate, thermodynamic study, Kinetic study. The composite can be characterized by FTIR, XRD, SEM. Future work will focus on optimizing the composite's properties and expanding it's application to other environmental pollutants. The bio-waste composite is expected to have high efficiency, cost effectiveness and environmental sustainable, offering a promising approach for water purification.

Keywords: *blackberry, Chitosan, cotton seed coat Adsorption.*

SYNTHESIS, SPECTRAL AND THERMAL STUDIES OF NI(II), CR(III), MN(III) AND VO(IV) COMPLEXES OF 2,4-DIHYDROXYACETOPHENONE SALICYLOYL HYDRAZONE (DHASH)

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Abstract*:*

Ni(II), Cr(III), Mn(III) and VO(IV) complexes of 2,4-dihydroxyacetophenone salicyloyl hydrazone (DHASH) have been synthesized and characterized by elemental analysis, molar conductance, magnetic moments, electronic, 1H NMR, Mass, IR spectra, ESR, and thermal studies. The molar conductivity data of the complexes show them to be non-electrolyte. The electronic spectral data together with magnetic moment suggest square planer geometry for Ni(II), octahedral geometry for Cr(III) and Squre pyramidal for Mn(III),VO(IV) complexes. The TG analysis suggests high stability for most of the complexes followed by thermal decomposition in different steps. The kinetic parameters for their decomposition have been evaluated by using the Freeman Carroll and Sharp-Wentworth methods. ESR spectra of vanadyl complexes were recorded and discussed.

Keywords*:* Salicyloyl hydrazone, complexes, thermal analysis.

ZNS QUANTUM DOTS AS FLUORESCENT SENSORS FOR ENVIRONMENTAL MONITORING

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Abstract:

Heavy metal pollution poses a significant threat to environmental sustainability, requiring innovative detection and monitoring strategies. In this study, ZnS quantum dots were synthesized and capped with glutathione to enhance their

interaction with heavy metal ions, specifically lead (Pb^{2+}). The synthesized quantum dots were characterized using UV-Visible, fluorescence, and FTIR spectroscopy. Fluorescence-based sensing studies revealed a strong TURN ON response in the presence of lead ions, indicating high sensitivity and selectivity. The linear range and limit of detection were determined, demonstrating the potential of ZnS quantum dots as effective fluorescence-based sensors for lead ion detection in environmental samples. This work highlights the role of nanotechnology in environmental monitoring, aligning with sustainable development goals by providing a reliable approach for detecting and mitigating heavy metal pollution.

DUAL-MODE DETECTION OF IRON USING CARBON DOTS CONJUGATED RATIOMETRIC AND COLORIMETRIC SENSORS

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Abstract:

Metal ions pose significant threats to both human health and the environment due to their toxicity, persistence and bio accumulative nature. Their detrimental effect highlights the urgent need for effective detection of these metal ions. This study presents a novel ratiometric sensor based on yellow emissive carbon dots conjugated with the blue emissive 2-amino terephthalic acid. The covalent conjugation between the -COOH group of carbon dots and $-NH_2$ of 2-amino terephthalic acid is achieved through carbodiimide bond formation via EDC-NHS reaction. The surface-functionalized carbon dots exhibited unique fluorescence properties and were evaluated for the detection iron (Fe^{3+}). The sensor demonstrated ratiometric sensing for Fe^{3+}, with colorimetric sensing as metal concentrations varied. This approach offers a promising avenue for the development of sensitive and selective probes for environmental heavy metal monitoring.

THE EFFECTIVE REMOVAL OF CU(II) FROM WASTEWATER BY USING PRE-TREATED ADSORBENT PREPARED FROM AGRICULTURAL WASTE

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Abstract:

Huge Industrial waste constituents the major sources of various kinds of metal pollution in natural water. There are large no. of metals which cannot be degraded or destroyed. The important Toxic metals are Cu & many more. There are numerous methods currently employed to remove and recover the metals from our environment and many physiochemical methods have been proposed for their removal from wastewater. Adsorption is one of the alternatives for such cases and is an effective purification & separation technique used in industry especially in water and wastewater treatments. Activated Carbon, also known as activated charcoal, which is crude form of graphite, substance which is used in lead pencils. Activated Carbon is widely used in heavy metals removal, dye removal and also have other applications. Activated Carbon has high surface area, adsorptive capacity, and high adsorption rates from the gas or liquid phase.

Activated charcoal have been prepared from the agricultural waste. The experiment results showed that maximum removal of copper by activated carbon prepared from agricultural waste is 94 % at optimum condition. The prepared activated carbon was characterized by scanning electron microscopy (SEM), Fourier transform infrared (FTIR) & X-ray diffraction (XRD).
Keywords: Heavy Metals, Activated Carbon, Agricultural Waste, Adsorption.

UNLOCKING THE POTENTIAL OF $CUFE_2O_4$ NANOMATERIALS FOR ENHANCED SUPERCAPACITOR PERFORMANCE: A COMPREHENSIVE REVIEW

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Abstract:

$CuFe_2O_4$-based nanomaterials have attracted considerable attention for supercapacitor applications due to their cost-effectiveness, environmental sustainability, and high theoretical capacitance. However, their low electrical conductivity and limited cycling stability hinder their large-scale use in energy storage systems. Transition metal doping, with elements like Ni, Co, Mn, and Zn, has shown promise in enhancing the electrochemical properties of $CuFe_2O_4$, addressing these limitations. This review discusses the synthesis methods, performance improvements, and challenges of transition metal-doped $CuFe_2O_4$ nanomaterials for supercapacitors.

Doping with transition metals improves the crystal structure, increases surface area, and enhances electrical conductivity, thereby boosting electrochemical performance. For example, Co-doped $CuFe_2O_4$ achieves a specific capacitance of up to 600 F/g at 1 A/g, while Ni-doped variants reach approximately 550 F/g. These materials exhibit enhanced energy densities, with Co-doped materials attaining 20–25 Wh/kg, and Ni-doped reaching 15–20 Wh/kg. Power densities range from 500 to 2000 W/kg, ensuring a good balance between energy storage and rapid charge-discharge capabilities. Cycling stability is also improved. Co-doped $CuFe_2O_4$ retains 90% of its capacitance after 5000 cycles, and Ni-doped $CuFe_2O_4$ maintains about 85% retention after 3000 cycles. Despite these improvements, further optimization is needed to address low conductivity and phase changes during cycling. Hybridization with conductive materials like graphene and carbon nanotubes is a potential solution.
Keywords: Supercapacitor, Nanomaterails, Spinal materials

TAILORING DRUG RELEASE WITH ACRYLIC ACID-BASED MOLECULARLY IMPRINTED POLYMERS: VALSARTAN AS A MODEL DRUG

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Abstract:

Molecularly, imprinted polymers (MIPs) have emerged as a promising platform for drug delivery applications due to their ability to selectively bind specific molecules, such as drugs, with high affinity and specificity. This study focuses on the synthesis and characterization of acrylic-based MIPs for the

controlled release of Valsartan, an antihypertensive drug. The MIPs were synthesized using a polymerization process that incorporated Valsartan as the template molecule, with acrylic acid in the presence of EGDMA as a crosslinking agent. The polymerization conditions were optimized to maximize the binding capacity and selectivity for Valsartan. The resulting MIPs demonstrated high affinity for Valsartan, exhibiting specific binding sites that facilitated the controlled release of the drug in simulated physiological conditions. Drug release kinetics were evaluated, showing a sustained and controlled release profile, which is ideal for improving the therapeutic efficacy of Valsartan. The stability, biocompatibility, and drug release properties of the MIPs were thoroughly assessed, indicating their potential as effective carriers for Valsartan in targeted drug delivery systems. This work highlights the advantages of acrylic-based MIPs in enhancing drug delivery efficiency, offering a promising approach for the treatment of hypertension and other related diseases.

SULFATED ZRO_2/Γ-AL_2O_3 CATALYST: AN EFFICIENT HETEROGENEOUS SYSTEM FOR THE SYNTHESIS OF TETRAHYDROBENZO[*B*]PYRAN DERIVATIVES

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Abstract:

A novel sulfated zirconia on gamma-alumina ($SO_4^{2-}/ZrO_2/\gamma$-Al_2O_3) catalyst was synthesized and evaluated for its catalytic efficiency in the organic transformation of substituted aldehydes, malononitrile, and dimedone to yield tetrahydrobenzo[*b*]pyran derivatives. The catalyst was prepared via impregnation of zirconia on γ-Al_2O_3, followed by sulfation and calcination to enhance its Brønsted and Lewis acidity. Characterization techniques such as X-ray Diffraction (XRD), Fourier-transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), and Transition Electron Microscopy (TEM) confirmed the structural and acidic properties of the catalyst. The catalytic activity was assessed under solvent-free conditions, demonstrating excellent yield, short reaction time, and recyclability for multiple cycles without significant loss in performance. The synergistic effect of ZrO_2 and γ-Al_2O_3 provided a high surface area and strong acid sites, facilitating efficient synthesis of tetrahydrobenzo[*b*]pyrans via a one-pot multicomponent reaction (MCR). This environmentally benign approach highlights the potential of $SO_4^{2-}/ZrO_2/\gamma$-Al_2O_3 as a heterogeneous acid catalyst in green chemistry applications.

***Keywords*:** Sulfated zirconia, γ-alumina, heterogeneous catalysis, tetrahydrobenzo[*b*]pyran, organic transformation.

GROUNDWATER QUALITY OF DHARNI TALUKA—THE MALNUTRITION CENTRE—OF CENTRAL INDIA

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Abstract

To determine the quality of groundwater in the malnutrition centre located in Maharashtra's Amravati district Dharni Taluka, sampling was conducted during the rainy season utilizing grab sampling methodology. Groundwater samples were taken from 50 sampling sites, which included 6% from hand pumps, 66% from dug wells, and 26% from borewells. Faecal coliform contamination was detected in 46% of the samples was found to have faecal coliform contamination. Faecal coliforms are indicative of contamination by human or animal faeces, which suggests poor sanitation and hygiene practices in the area, with 36% of Escherichia coli identified which is a more specific marker of recent faecal contamination and a major concern for waterborne diseases. The results indicated that the levels of microbiological contamination, especially coliform and E. coli, surpassed safe drinking water standards at several sampling sites. This suggests that poor hygiene and sanitary conditions are present in the study area and practiced by the residents, which may contribute to groundwater contamination leading to malnutrition in children under the age of 5.

Keywords: Central India, Dharni, Escherichia coli, Groundwater quality.

RECENT DEVELOPMENTS IN GRAPHENE-BASED MATERIALS FOR WASTEWATER PURIFICATION

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Abstract:

Adsorption is a cost-effective method for water purification, with carbon-based materials widely used for their stability and scalability. Graphene, a single layer of graphite, has gained attention since 2004 for its exceptional properties and high surface area, making it a strong adsorbent. Other graphene-based materials, such as graphene oxide and reduced graphene oxide, have also been studied for wastewater treatment. This review explores the potential of graphene-based nanocomposites for pollutant removal from water. Additionally, it discusses challenges in large-scale applications and future research directions.

***Keywords*:** Graphene materials, Adsorption, Pollutants Environmental remediation, Water treatment.

SYNTHESIS OF REDUCED GRAPHENE OXIDE AND ITS POTENTIAL APPLICATION IN WATER PURIFICATION TREATMENT

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Abstract

Pollution by toxic and harmful chemicals, particularly, dyes and pigments has been a serious global issue and expected to be worsening in coming years. The effluents from textile, paper, printing, electro-platting, pulp, cosmetics, pharmaceuticals and food industries are the major source of water pollution and jeopardizing the natural resources. Discharging of organic dyes in the water bodies has made significant hazardous impact on the aquatic life by blocking the penetration of sunlight. Therefore, the removal of dyes from the industrial effluents, before their

discharged into the aquatic bodies and surrounding environment, is gaining large attention. The futuristic challenges are focusing on the science of interface between the pollutants in the water and the materials to be used for their efficient removal in sustainable and affordable manners. Over the past two decades, several approaches have been developed for removal of dyes; among them, adsorption has been recognized as one of the fast, inexpensive and effective method. A number of adsorbent materials such as clays, zeolites, wool fibres, bio-mass, synthetic and bio-polymers, activated carbon etc. have been used for water purification. Carbon-based nanomaterials are gaining immense interest as adsorbents owing to their high adsorption capacity. This study highlights the synthesis of reduced graphene oxide and its application to remove malachite green (MG), eosine, and safranin (SF) dyes from waste water. The adsorption of these dyes in simulated waste water was assessed using a UV-visible spectrophotometer and visual observations. In order to understand the interaction between reduced graphene oxide and dyes, adsorption of dyes were carried our as a function of pH.

***Keywords*:** Dyes, reduced graphene oxide, adsorption, simulated waste water

DESIGN AND EVOLUTION OF COPOLYMER DERIVED FROM 2,4 DIHYDROXYPROPIOPHENONE, 4-PYRIDILAMINE, AND FORMALDEHYDE

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Abstract:

A novel copolymer, 2,4 DPP-4PF, was synthesized by polycondensing 2,4-dihydroxy propiophenone, 4-pyridylamine, and formaldehyde, using 2M HCl as a catalyst. The reaction was conducted at a temperature between 122-124 °C for up to four hours, maintaining a molar ratio of 1:2:1. The composition of the copolymer (2,4 DPP-4PF) was determined through elemental analysis, while Gel Permeation Chromatography (GPC) used to determine its number-average molecular weights. The copolymer characteristic functions and constants were evaluated by measuring its viscosity in dimethyl sulfoxide (DMSO). The structure of the copolymer was elucidated through spectral and physician-chemical analysis like FTIR spectra. Additional techniques, such as Elemental analysis, ultraviolet-visible (UV-Vis) spectroscopy, and proton nuclear magnetic resonance (NMR) spectroscopy, were employed to further characterize 2,4 DPP-4PF copolymer. Copolymer surface morphology have been carried out by using scanning electron microscopy and XRD.

Keywords: Polycondensation, Synthesis, Copolymer, Dihydroxypropiophenone.

ZOOPLANKTON DIVERSITY OF SHEKHDARI DAM WATER IN WARUD TAHSIL OF AMRAVATI DISTRICT (M.S.)

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Abstract:

The study was carried out at Shekhdari dam in Warud tahsil of Amravati district belonging to state of Maharashtra. There was no back record found for

diversity of zooplankton occurring in this dam. The analysis was taken into observation for the period of one year and five major groups of zooplankton were observed i.e., Rotifera, Ostracoda, Cladocera, Copepoda and Protozoa. Among them, most of the species belongs to Rotifera.

Keywords – Plankton, copepods, crustaceans, rotifera, Shekhdari dam, diversity.

GC-MS PROFILING OF *DIGITARIA CILIARIS* (RETZ) KOEL LEAF EXTRACT AND ITS POTENTIAL FOR BIOPHARMACEUTICAL INNOVATIONS

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Abstract

The growing interest in plant-based bioactive compounds has led to extensive research on medicinal plants for their therapeutic applications. This study investigates the phytochemical composition of *Digitaria ciliaris* (Retz) Koel leaf extract using Gas Chromatography-Mass Spectrometry (GC-MS) to identify potential bioactive constituents. The analysis revealed the presence of multiple phytochemicals, including esters, fatty acids, and steroidal derivatives, known for their antimicrobial, anti-inflammatory, and immune-modulating properties. Additionally, an in-silico ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) analysis was conducted to evaluate the pharmacokinetic behavior of key compounds. The findings highlight the pharmaceutical relevance of *Digitaria ciliaris*, supporting its potential application in herbal drug formulations and modern biopharmaceutical research. Further studies are needed to isolate and validate the therapeutic effects of these compounds in clinical settings.

Keywords**:** *Digitaria ciliaris*, GC-MS, bioactive compounds, phytochemical profiling, drug discovery, biopharmaceutical applications.

SYNTHESIS AND APPLICATION OF SORBITOL BASED POLYMERS AND THEIR CLEANING CAPACITY

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Abstract:

For several thousands of years natural polymers have been indispensable for mankind to serve as food, to provide shelter and clothing and to serve as a source of energy. During the development of the human society the use of natural polymers become more sophisticated illustrated by the development of various technologies such as papermaking, textile manufacturing and wood processing. But now days these synthetic polymers are present in almost every aspect in our life and they are extensively used in the packaging industry, building and construction thermal and electrical appliances automotive industry, coating application as well as in demanding applications like military and aerospace. A fundamental fact one should realized is that all developments of the polymers[1] industry cannot be continued and not even be maintained without the abundant availability of raw materials which are typically fossil resources base. starch, sorbitol and sugar are globally available commodities of vegetable origin. These materials are produced in huge amount and can be used as a key ingredients in detergent compositions. In our earlier efforts we have used

maleinized oils, resin, starch and sorbitol to develop novel polymers which can be used in powder, liquid and cake detergents. In western and developed world powder and cake detergents have already been replaced by liquid laundry detergents. In this present piece of work cheaper vegetable products like sugar, starch and sorbitol have been used to synthesis polymers which can be used as a replacement of acid slurry of petroleum origin. The liquid laundry detergents[4] available in India are very costly. This is an attempt to synthesize cost effective ecofriendly and technically superior liquid laundry detergents.

Keywords: Polymers, Sugar, Sorbitol

GREEN SYNTHESIS OF SCHIFF BASES, ITS COMPLEXES AND ITS ANTIMICROBIAL APPLICATIONS

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Abstract:

Green chemistry is the field by which it offers significant environmental and financial benefits above traditional synthetic methods. In the modern era, green chemistry attention has to invent an additional organic synthesis method in which different reaction environments must locate, which decreases the use of toxic organic solvents or toxic chemicals. These green methods enhance the selectivity, reaction time, and product activity. A Schiff base is considered as an azomethine group, it is normally produced by condensation of primary amines with aldehydes. Schiff bases have varied importance due to its many biological and pharmaceutical activities It have wide-range applications in the food industry. In this study, we tried to focus on the green synthetic methods used for synthesis of Schiff bases to find the best technique which offers higher yields in shorter time within eco-friendly environment. The increasing attention about the natural acid catalyst like as fruit juices use in chemical synthesis due to their acidic nature, benign environmental character, enzymatic action and low-cost. We are now focusing on the significance of fruit juices use as a natural biocatalyst in organic synthesis.

Keywords: Green Synthesis, Schiff Bases, Fruit Juices.

CP*CO(III)-MEDIATED C–H AND N–N BOND ACTIVATION: A STRATEGY FOR ISOQUINOLINE SYNTHESIS USING N-TOSYLHYDRAZONE DIRECTING GROUP

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Abstract:

In this work, we present a novel, cost-efficient, and sustainable method for the synthesis of isoquinolines *via* a C–H bond activation strategy, utilizing a cobalt catalyst known for its affordability and versatility. The reaction is facilitated by *N*-tosylhydrazone, a rarely explored but highly effective directing group, which serves as an internal oxidant to drive an annulation reaction with internal alkynes, enabling selective C–H/N–N bond functionalization. This catalytic protocol is notable for its broad applicability across a diverse range of substrates, consistently providing moderate to excellent yields without the need for external oxidants, thus improving reaction efficiency and reducing environmental impact. Furthermore, the ease of

substrate preparation, combined with the scalability of the reaction up to gram-scale quantities, underscores the practicality of this methodology. The broad substrate scope, significant product yields, and operational simplicity make this approach a valuable contribution to the field of C–H activation and isoquinoline synthesis.

MOLECULAR IODINE ASSISTED GREEN SYNTHESIS OF PYRAZOLO[3,4-D]-PYRIMIDINE THIONES

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Abstract:

An efficient and green method for the preparation of 3-phenyl-1H-pyrazolo [3,4-d] pyrimidine Thiones derivatives in minutes of time with high yields is accomplished by the mixture of ethyl acetoacetate, hydrazine hydrate, thiourea, and different benzaldehydes. The reaction is accomplished in the presence of molecular iodine in an excellent yield.

Keywords: Benzaldehyde, ethyl acetoacetate, thiourea, ionic liquid, hydrazine.

DESIGN, SYNTHESIS, AND ANTIFUNGAL EVALUATION OF AMINOMETHYLTHIAZOLE DERIVATIVES

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Abstract:

In this study, a series of 2-amino substituted-5-methylthiazole derivatives (3a-e) were synthesized via the reaction of 2-amino-5-methylthiazole (1) with various substituted chlorobenzene or bromobenzene (2) in the presence of sodium methoxide in DMF under reflux conditions. The products were obtained in good yields (65-87%) and characterized by FTIR, NMR and mass spectrometry. The synthesized compounds were further evaluated for their antifungal activity through in silico studies and in vitro well-plate method against Staphylococcus aureus, Aspergillus niger, and Candida albicans. The antifungal activity was assessed by measuring the zone of inhibition (mm) on agar culture plates. The findings indicate that these thiazole derivatives show potential as novel antifungal agents, with preliminary data suggesting their effectiveness. These compounds offer a basis for the development of more potent antifungal agents through further structural modifications.

***Keywords*:** Aminomethylthiazole, DMF, Derivatives, Antifungal Activity, In Silico Studies.

FE-SEM AND EDS ANALYSIS OF ACTIVATED CARBONS DERIVED FROM ABUTILON INDUCUM AND CASUARINA CUNNINGHAMIANA STEMS AT DIFFERENT TEMPERATURE

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Abstract:

In the present work activated carbons are derived Abutilon Indicum stem and Casuarina Cunninghamiana stems by zinc chloride activation at different temperatures

(400°C, 500°C) were investigated with the help of FE-SEM and EDS to study the topography of activated carbons. This study reveals that carbonization temperature, activation temperature, activating agent affect the porosity of activated carbons.
Keywords: FE SEM, EDS, Abutilon Indicum stem and Casuarina Cunninghamiana.

WATER POLLUTION: CAUSES AND EFFECTS

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Abstract:

Water is life for all but this water is polluting day by day in severe conditions. So it can be said that our life (water) is not safe now. We are in crisis period. Water pollution is a major serious problem for all over the world. More than70% of the fresh water in liquid form of our country is converted into being-unfit for consumption. water contamination caused by natural and anthropogenic activities, poses a significant threat to public health globally. Water pollution studies generally involves a scientific understanding of the physical, chemical, and biological, processes that control the movement of contaminants in the underground environment. This review highlights the existing scenario of water pollution its sources, their toxicity to human health, and approaches to health risk assessment.
Keywords: Water pollution, anthropogenic activities, human health, Toxicity.

RECENT DEVELOPMENTS IN SYNTHESIS OF NANOMATERIALS AND COMPOSITES OF VANADIUM AND COBALT SULFIDES FOR SUPERCAPACITORS - A REVIEW

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Abstract:

The growing demand for advanced energy storage solutions has spurred significant research into supercapacitors, known for their exceptional power density, rapid charge-discharge capabilities, and long-term stability. Among the promising materials for supercapacitors, vanadium disulfides (VS_2), cobalt disulfides (CoS_2), and their composites have attracted considerable attention due to their unique electrochemical properties and tunable structural characteristics. This review focuses on recent advancements in the synthesis strategies of nanomaterials and composites based on vanadium and cobalt disulfides. Various methodologies, including hydrothermal, solvothermal, and chemical vapor deposition techniques, are critically analysed for their effectiveness in controlling morphology, particle size, and compositional uniformity. The synergistic effects of combining these disulfides with other materials to enhance conductivity, stability, and energy storage performance are thoroughly discussed. Furthermore, challenges such as material degradation, scalability, and the optimization of composite properties are explored. This review provides a comprehensive perspective on the synthesis and application of vanadium and cobalt disulfides and their composites, contributing to the development of next-generation high-performance supercapacitors.
Keywords: Supercapacitors, Nanomaterials, Vanadium disulfides, Cobalt disulfides.

SUSTAINABLE AGRICULTURE: A PATH TO FOOD SECURITY AND ENVIRONMENTAL BALANCE

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Abstract:

Sustainable agriculture is a crucial approach to ensuring global food security while preserving natural resources for future generations. This presentation explores the principles, practices, and benefits of sustainable agriculture, emphasizing its role in enhancing soil health, conserving water, reducing chemical inputs, and promoting biodiversity. It highlights innovative techniques such as organic farming, agroforestry, precision agriculture, and regenerative practices that improve productivity while minimizing environmental impact. Additionally, the presentation addresses the economic and social dimensions of sustainability, including the role of smallholder farmers, policy support, and community-driven initiatives. By adopting sustainable agricultural methods, we can achieve a balance between food production, environmental conservation, and economic viability, ensuring a resilient and thriving agricultural system for future generations.

APPLICATIONS OF TAYLOR'S SERIES IN REAL LIFE

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Abstract:

The Taylor series is a powerful practical tool—a means of solving real-world problems. By reducing complex functions to infinite polynomial expansions, it permits efficient computation and accurately provides approximations. It plays a crucial role in fields such as artificial intelligence, physics simulations, financial modeling, and engineering applications. From optimizing machine learning algorithms to improving the precision of space navigation, the Taylor series is fundamental to advancing modern technology. Additionally, it aids in numerical solutions for differential equations, computational fluid dynamics, and medical imaging. This work also examines error estimation and its implications for real-world applications, ensuring trustworthy and efficient approximations. By seamlessly integrating mathematical theory with practical decision-making, the Taylor series continues to drive innovation across engineering, computing, and scientific research.
Keywords: Taylor Series Expansion, Numerical Approximation, Machine Learning Optimization, Scientific Computing, Quantum Simulations, Computational Fluid.

SCHIFF BASE LIGAND AND ITS NOVEL Mn(II), Co(II), Ni(II), Cu(II) METAL COMPLEXES: SYNTHESIS, STRUCTURAL CHARACTERIZATION AND BIOLOGICAL ACTIVITIES

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Abstract:

The study describes the synthesis, characterization and biological activity of a novel Schiff base ligand and its transition metal complexes. The Schiff base ligand was obtained by a condensation reaction between (2-Hydroxy-5-

nitrophenyl)(phenyl)methanone(HNPM) and 2,4-dinitrophenylhydrazine(2,4-DNP) using ethanol as solvent. The complexes of this ligand have been prepared using metal acetates of Mn(II), Co(II), Ni(II) and Cu(II) under reflux in ethanolic medium. The ligand and its metal complexes were characterized by solubility, melting point and elemental analysis. These compounds were further identified by analytical techniques, FTIR, NMR, thermogravimetric analysis, diffused reflectance and magnetic susceptibility measurements. . The ligand and its transition metal complexes were also subjected to in vitro biological activities i.e. antimicrobial and antifungal. All the compounds were screened for antibacterial activity against some clinically important bacteria, such as E. coli, S. typhy, S. aureus, P. aeruginosa and K. pneumonie. The presence of metal ions in Schiff base complexes enhances their pharmacological potential by improving bioavailability, interaction with biomolecules, and catalytic efficiency. Studies have demonstrated their role in DNA binding, protein interactions, and oxidative stress modulation, making them promising candidates for drug development.

Keywords: pharmacological potential, P. aeruginosa, HNPM, antifungal.

SYNTHESIS, SPECTRAL, THERMAL AND BIOLOGICAL STUDIES OF SOME SCHIFF BASE COORDINATION POLYMERS

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Abstract:

The new Schiff base ligand derived from Terephthaladehyde and Thiocarbohydrazide have been synthesized in Ethanol -DMF medium and its coordination polymers with Ti (III), VO(VI), Cr(III), Mn (III), Fe(III), Co(II),Ni(II) and Cu(II) ions have been complexes prepared. The formation of Schiff base ligand has been confirmed by IR, 1H NMR and mass spectroscopy. The coordination polymers have been characterized by UV-Visible absorption spectra, Infra-Red spectra, elemental analysis and magnetic moments measurements. The thermal decomposition of these coordination polymers was investigated by thermogravimetric analysis and data have been analyzed for various kinetic parameters using Broido equation. The solid-state electrical conductivity of the ligand and its coordination polymers in the form of compressed pellet was studied in the temperature range from 313 to 413 K. All the compounds were found to show semiconducting nature. The Mn(III), Fe(III), Co(II) and Ni(II) complexes have also been assessed for the catalytic epoxidation of styrene.

Keywords: Metal complex, Schiff bases, Spectral studies, TG/DTA.

NEOTERIC BREAKTHROUGH IN FLEXIBLE PEROVSKITE SOLAR CELL DEVELOPMENT

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Abstract:

Recent progress in flexible Perovskite solar cell development has been remarkable, with efficiency exceeding 20%. Researchers have focused on optimizing perovskite composition, interface modification, and charge transport materials to

achieve this milestone. Low-temperature fabrication methods have been crucial in enhancing perovskite film quality, ensuring full coverage, uniform morphology, and good Crystallinity. Additionally, advancements in flexible transparent electrode materials have improved mechanical stability, while interface layers with high transmittance and carrier mobility have been key factors in enhancing device performance. The potential applications of flexible perovskite solar cells in portable electronics, wearable power sources, and industrial settings have also been highlighted, indicating a promising future for this technology. Hence we will ventilate acquirement of flexible perovskite solar cell (FPSCs) and covering layer of electron/hole transport material and electrode material as well as we gives overview of FPSCs and hype of their future development.

SYNTHESIS, CHARACTERIZATION OF 3-((5-(2-AMINOPHENYL)-1,3,4-THIADIAZOLE-2-YL) PYRIDINE-2,6, DIAMINE AND THEIR TEXTILE APPLICATIONS

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Abstract:

This study reports the synthesis, Characterizations and applications of a new azo-linked compound, 3-((5-(2-aminophenyl)-1,3,4-thiadiazole-2-yl) Pyridine-2,6, diamine for textile applications. The synthesized compound was characterized using FT-IR, ^{1}H-NMR and ^{13}C NMR spectroscopy, confirming the presence of key functional groups such as the azo (-N=N-) and thiadiazole moieties. Moreover, this study investigated the color fastness of as prepared dye on three different fabric types: Cotton, Polyester, and Silk. The dyes fastness properties, were assessed on Terrycloth, Nylon and Cotton Mesh, were evaluated under various conditions, such as neutral, alkaline (NaOH) and acidic (HCl) environments. We found that the suitability of Terrycloth and Nylon for high performance textile applications requiring color durability.

EFFECT OF ENDOSULFAN ON THE NUTRITIVE VALUE OF FISH, *RASBORA DANICONIUS*

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Abstract:

The use of chemical pesticides in agricultural practice is slowly poisoning the life on the planet. The uncontrolled release of these chemicals kill the non-target organism. Therefore, there is an urgent need to monitor the use of pesticides. The access pesticides impose adverse effects to humans as well as Flora and Fauna. Many Insecticides are considered potentially toxic for fishes. If they enter the body they get biologically degraded or sometimes they get biomagnified producing more harmful effects. They accumulate in living tissues like liver, brain, muscle and fat and may alter physiological processes.

For the above work LC_{50} for 96 hours was found to be 0.08 ppm for fish *Rasbora daniconius*. The fish was exposed to sub lethal dose of Endosulfan for 28 days and the nutritive value of glycogen, protein and lipid was estimated on 1st, 7th,

14th and 28th day. The glycogen content in muscle was found to be decreased after initial elevation of 3 days. The glycogen content dropped by 61.88% on 28th day. The amount of muscle protein content after 28 days depleted by 68.36% while lipid content shows depletion by 54.67%. The depletion of nutritive value with respect to biochemical constituents due to Endosulfan toxicity was found to be in the order as Protein > Glycogen > Lipid.

Keywords: *Rasbora daniconius*, Fish pesticide, Endosulpan, glycogen, proteins.

STRUCTURAL PROPERTIES OF SPRAY DEPOSITED BA DOPED ZNO THIN FILMS

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Abstract

Nanostructured barium doped zinc oxide (BZO) thin films are promising materials for optoelectronic and sensor devices because of their improved structural qualities. In this research, we created BZO films using a simple spray pyrolysis method and carefully studied their structure. X-ray diffraction showed that the films maintained the typical hexagonal structure of zinc oxide, with minor changes due to the added barium. Scanning electron microscopy revealed that the barium doping altered the film's surface, affecting grain size and making the film more uniform. These structural improvements indicate that barium effectively modifies the zinc oxide's crystal quality and defect levels, which could lead to better performance in devices. This study offers useful information for designing improved zinc oxide films for advanced electronic and optical applications.

***Keywords*:** Nanostructured; Thin film; BZO; Structural properties.

BIOSORPTION OF FLUORIDES: A NEW APPROACH TO WATER DEFLUORIDATION

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Abstract:

Biosorption of Fluorides: A New Approach to Drinking Water Defluoridation Fluorosis, agonizing and crippling disease occurs in the regions where the ground water sources used for drinking purpose are rich in fluorides. Microorganisms have the ability to establish biosorption resistance to various contaminants as the bacterial cell wall contains binding groups of toxic pollutants like sulphynyl, phosphates, carboxylates and amines that aid in metal ion interaction. Microorganisms are playing a key role in biosorption of polluted water contaminants over last few decades. In the present investigation, fluorinated aqueous solution was treated with novel bacterial isolates, viz *Bacillus sp. Escherichia sp. Pseudomonas sp. Proteus sp.* isolated from potable water of Pombhurna region to screen the competence of potential bacteria for the removal of fluorides. SPADNS colorimetric method was adapted to measure fluoride concentration in broth media as well as before and after treatment of water sample. The advantage of using microorganisms over other treatment are ease of operation and lower sludge production.

***Keywords**:* Fluorosis, Biosorption, Contaminants, Fluorinated, Potable water.

EFFECT OF SULFURIC ACID CONCENTRATION ON THE STRUCTURAL AND FUNCTIONAL PROPERTIES OF GRAPHENE OXIDE SYNTHESIZED VIA MODIFIED HUMMERS' METHOD

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Abstract:

This research mainly focuses on the synthesis of carbon-based nanomaterial graphene oxide (GO). The functional groups and physical properties of graphene oxide (GO) are sensitive to concentration of acid in the reactions when GO samples using a modified Hummer's method. Compared to GO synthesized using 99% sulfuric acid (H_2SO_4), GO prepared with 93% H_2SO_4 had greater interlayer space, fewer structural flaws, and less π–π conjugation. The GO sheets made with varying H_2SO_4 concentrations had almost the same yield and carbon to oxygen balance. More significantly, GO created with 93% H_2SO_4 has less carbonyl groups but more carbon–oxygen single bonds, such as epoxy and hydroxyl groups, than GO synthesized with 99% H_2SO_4.

Keywords: graphene oxide (GO), modified Hummer's method, π–π conjugation.

EXPLORING SOLID POLYMER-SUPPORTED REAGENTS FOR SELECTIVE OXIDATION OF AROMATIC SECONDARY ALCOHOLS

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Abstract:

Polymer-supported reagents have become increasingly widespread in various applications in recent years. Researchers in the laboratories of agrochemical and pharmaceutical industries now normally utilize these compounds to craft arrays of small organic molecules for screening purposes. This analysis seeks to underline key applications of these promising materials in organic synthesis. Additionally, it provides a complete set of polymeric reagents recently employed in organic synthesis.

Chemical kinetics, a committed branch of chemistry, focuses on the examination of reaction rates. A comprehensive study of chemical kinetics, in combination with other non-kinetic studies, allows for a systematic understanding of reaction mechanisms. Reactions span a wide range of speeds; some occur swiftly, within fractions of a second (down to the femtosecond level), while others progress extremely slowly, as exemplified by the gradual rusting of iron. Between these extremes, there are reactions that clarify over a reasonable timeframe, making them open to to systematic study through suitable methods.

A number of researchers have extensively contributed to the field of chemical kinetics. revolutionary work by figures such as Ludwig Ferdinand Wilhelmy, Wilhelm Ostwald, C. F. Wenzel, Louis Jacques Thénard, Pierre Eugene Marcelin Berthelot, Leon Pean de Saint-Gilles, Peter Waage, and Harcourt has laid the foundation for our understanding.

Keywords: Polymeric reagent; Solid-supported reagent, oxidation, Alcohols.

BIOLOGICALLY SYNTHESIZED CHITOSAN NANOPARTICLES: A POTENT SOLUTION FOR MANAGEMENT OF GRAPEVINE *(VITIS VINIFERA)* PHYTOPATHOGENS

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Abstract:

Grapevine plants *(Vitis vinifera)* has high economic significance globally due to their diverse applications in multiple industries. Grapevines are one of the most valuable horticultural crops, with great market demand for both table grapes and grapes for wine production. Global market for grapes and grape products provides significant revenue for cultivators and contributes to the agricultural GDP of grape-growing regions such as Nashik (M.S. India). Phytopathogens create a significant threat to viticulture, affecting the health of grapevine and total yield. Common diseases of grapevine include powdery mildew, downy mildew, and botrytis bunch rot. Traditional methods of disease control, including chemical fungicides and pesticides have multiple environmental and health risks. Effective management strategies include the isolation, identification, and biological control of prevalent grapevine pathogens. Biologically synthesizes nanoparticles (BNPs) such as chitosan have emerged as a promising alternative due to their biocompatibility, biodegradability, and effectiveness at low concentrations. Plant Growth promoting Rhizobacteria should be explored for their potential of synthesis of Chitosan nanoparticles in control of phytopathogens from grapevines and other biological control strategies harness can natural antagonists to mitigate disease impact.

Keywords: Botrytis Bunch rot, Biological Control, Chitosan Bionanoparticles.

HEUSLER ALLOYS

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Abstract:

Ternary intermetallic compounds are called as Heusler alloys. These compounds generally crystallize with Fm-3m or F-43m space group. Physical properties of these compounds are very interesting. Materials of this group are semiconductors, half-metallic ferromagnets, superconductors, heavy Fermion systems, shape memory alloys, and topological insulators. Half-metallic Heusler alloys have been proven to be better candidates than the traditional materials. These materials possess finite density of states (DOS) at Fermi energy (E_F) in one spin configuration, while zero density of states is present for most of the half-metal materials in the other spin configurations. Heusler alloys possess interesting magnetic properties. We can observe attractive diverse properties such as itinerant and localized magnetism, antiferromagnetism, helimagnetism, Pauli paramagnetism or heavy-fermionic behaviour in the same family of alloys. When magnetic field is applied, these materials exhibit large changes in shape and other properties. Hence, researchers and scientists are continuously trying experimentally and theoretically to discover

such innovative materials like Heusler alloys by using different elements. These materials usually order ferromagnetically, that is why they are called smart materials. These magnetic Heusler alloys are very much useful in the field of technology such as in spin based electronic devices, thermoelectric and superconductors. Interesting factors in these alloys are half-metallicity and high spin polarization. Half-metallic ferromagnetic Heusler alloys are used in many magnetoelectronic devices due to their imbalance in the number of majority and minority spin carriers. These compounds are also used in spin injectors for spin dependence devices. Due to all these facts described above Heusler alloys have engrossed much attention due to their potential application as smart materials in recent years.

GREEN SYNTHESIS OF COBALT OXIDE (CO_3O_4) NANOPARTICLES USING CITRUS LIMETTA PEEL EXTRACT FOR PHOTOCATALYTIC DEGRADATION OF RHODAMINE-B DYE

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Abstract:

Water pollution poses a significant environmental challenge, particularly in developing and underdeveloped nations. Photocatalytic degradation of organic pollutants is a promising strategy for mitigating environmental contamination and preserving the green ecosystem. In this study, cobalt oxide (Co_3O_4) nanoparticles were synthesized via a green, cost-effective, and eco-friendly hydrothermal method using Citrus limetta peel extract as a reducing and stabilizing agent. The structural and optical properties of the synthesized nanoparticles were systematically characterized using EDX, SEM, XRD, FTIR, and UV-DRS techniques. The photocatalytic performance of Co_3O_4 nanoparticles was evaluated for the degradation of Rhodamine B dye under sunlight irradiation. Furthermore, the reuse of the treated water for irrigation highlights a sustainable and economically viable approach for wastewater management in the textile industry, addressing both environmental and resource.

Keywords: Green synthesis, Metal oxides, Photo catalyst, Rhodamine-B.

VINEGAR: ENVIRONMENTALLY BENIGN AND EFFICIENT CATALYST FOR ACETYLATION OF AROMATIC AMINES

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Abstract:

Acetylation is very important reaction as it gives industrially important products. It is used for Protection of amino group specifically when the other reactive functional groups are present. Literature shows its application in protein synthesis. "Acetylation of amines" refers to a chemical reaction where an acetyl group (**CH_3CO-**) is added to a nitrogen atom in an amine molecule, essentially replacing one or more hydrogen atoms attached to the nitrogen with the acetyl group, forming an N-acetyl derivative; this reaction typically involves using reagents like acetyl chloride or acetic anhydride with the amine compound.

Present study reports use of vinegar for the acetylation of aromatic amines. Acetic acid present in vinegar acts as acid catalyst in acetylation of aromatic amines. Acetylation of different aromatic amines was carried out by using vinegar and acetic

anhydride as an acetylating agent. The reaction was carried out at room temperature and under solvent free condition. The present methodology illustrates the efficient acetylation of primary aromatic amines by vinegar in weakly acidic condition at room temperature. The acid catalyst does not harm the environment. It is eco-friendly and cheaply available. Acetylation of aromatic amines is primarily used in organic synthesis as a protective group for amino functionalities, allowing chemists to selectively modify other parts of a molecule while temporarily "blocking" the amine group. A common example is acetylation of aniline to form acetanilide, which is used as a precursor in the synthesis of various pharmaceuticals.

Keywords: Vinegar, acetylation, acetic acid, amines.

RECENT ADVANCES AND FUTURE PROSPECTS OF MN-CO BASED HYBRID SUPERCAPACITORS

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Abstract:

Hybrid supercapacitors are emerging as key players in the next generation of energy storage technologies, combining the high power capabilities of capacitors with the energy density of batteries. Among various material combinations, manganese and cobalt-based materials show significant promise due to their unique electrochemical properties, abundant redox sites, and high theoretical capacitance. This presentation provides a comprehensive literature review on recent advances in Mn-cobalt based hybrid supercapacitors, focusing on synthesis strategies, structural characteristics, charge storage mechanisms, and electrochemical performance. Additionally, the discussion extends to future research directions, challenges in material optimization, and practical applications. By analyzing existing studies, this talk aims to provide insights into the role of Mn-Co hybrids in improving energy storage efficiency and their potential for commercialization in sustainable energy systems.

QUNATITAVIVE ANALYSIS OF VINYL MAGNESIUM BROMIDE (1.0 M In THF) by HPLC: EFFICEINCY AND VALIDATION

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Abstract:

Reverse phase high performance liquid chromatography (RP-HPLC) method has been developed and validated for determination of the efficiency of Vinyl Magnesium Bromide which is highly reactive Grignard Reagent used widely in the organic synthesis, chemical and pharmaceutical manufacturing. This RP-HPLC method was developed and validated as per International Council of Harmonization's (ICH) quality guideline for "Validation of Analytical Procedure Q2(R2)", exhibiting high level of efficacy. Vinyl Magnesium Bromide a non-chromophore compound quantified after derivatization process with acetophenone which resulted in the formation of 2-phenylbut-3-en-2-ol. The formation of 2-phenylbut-3-en-2-ol is measured as efficiency of the vinyl magnesium bromide. Using RP-HPLC equipped with injector, pump, and UV detector, effective separation was achieved between

acetophenone and 2-phenylbut-3-en-2-ol on Inertsil ODS 3V C18 (150 x 4.6) 3.0µm HPLC column employed with gradient elution program. A homogenous mixture of trifluoroacetic acid, purified water and acetonitrile (1:650:350) used as mobile phase-A and water and acetonitrile used as mobile phase-B in the ratio of 1:1. With a flow rate of 1.0 mL per minute, 5 µL of injection volumed is injected keeping the column oven temperature as 30°C. Detector wavelength of 210 nm was employed for detection and quantification. The analytical method was identified as specific/selective. The range was established from 50% to 150% using linearity, with a correlation coefficient of 0.99999, a 0.25 % Y intercept, and an accuracy of 99.75%. Method and intermediate Precision were also demonstrated, with an NMT variability of 0.5 %. Studies on robustness show no significant changes in the outcomes. There is no substantial variation in the outcomes. For all method validation performance characteristics, system appropriateness parameters such as tailing factor, theoretical plates, and percentage RSD of replicate standard injection were found to be well within acceptable limits. It has been determined that this novel RP-HPLC method is specific, linear, accurate, precise, and robust.

PREPARATION AND EVALUATION OF A HERBAL GELATIN-CHITOSAN COMPOSITE FILMS WITH PHYTOCHEMICALS OF *SOLANUM TORVUM*

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Abstract:

Wound healing is the body's natural process of regenerating dermal and epidermal tissue. It is the process by which the body gets the wounded area as close to its natural state as it can. The skin has a remarkable ability to heal itself after a minor wound, but when the damage is serious or covers a big area of skin, it is necessary to cover the wound surface with an appropriate dressing right once in order to protect the wound and hasten its healing process. In the end, one of the main objectives of wound care is to provide rapid wound coverage, whether it be temporary or permanent. Because of its many benefits, biomaterial-based films are becoming more and more popular. Composite film dressings use a variety of biomaterials, such as biodegradable natural polymers. Both gelatin and chitosan have been shown to have the ability to heal wounds. Both polymers have the ability to heal wounds, and their combination has improved this ability. Thus, chitosan, gelatin, and leaf extracts from *Solanum torvum* were combined to create the composite films. To determine the suitability of the created combination for wound healing activity, the composite film was assessed for *in vitro* tests, including tensile strength, thickness, folding endurance, water absorption capacity, and physicochemical characterization. The study found that the combination of chitosan, gelatin, and leaf extracts from *Solanum torvum* had better wound-healing properties than chitosan and gelatin film alone.

Keywords- Wound, composite film, *invitro tests*, physicochemical characterization.

AN EVALUATION OF ANTIBACTERIAL ACTION AND TEETH WHITENING EFFECT OF LEAF EXTRACTS OF PSIDIUM GUAJAVA – A PRELIMINARY STUDY

Abstract:

Psidium guajava (L.), a member of the Myrtaceae family, is a widely cultivated tropical fruit with documented pharmacological properties, including

anticancer, antidiabetic, antioxidant, antidiarrheal, lipid-lowering, and hepatoprotective effects. This study aimed to evaluate the antibacterial activity of an aqueous *Psidium guajava* leaf extract using the disc diffusion method against *Staphylococcus aureus*, *Enterobacter sp.*, and *Pseudomonas aeruginosa*, as well as to assess the teeth-whitening potential of a formulation containing *Psidium guajava* leaf powder, roasted alum powder, and common salt. The results demonstrated significant antibacterial activity, with an increased zone of inhibition. Additionally, the teeth-whitening assessment revealed a notable improvement in shade following treatment with *Psidium guajava* extract. These findings suggest that *Psidium guajava* leaves possess promising antimicrobial properties and could serve as a natural alternative in dental applications for oral hygiene and teeth whitening.

Keywords: *Psidium guajava, antimicrobial, teeth whitener, dental product*

POLYANILINE-TIO_2 COMPOSITE-BASED DYE-SENSITIZED SOLAR CELLS

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Abstract:

Polyaniline (PANI)-titanium dioxide (TiO_2) composites have emerged as promising photoanode materials for dye-sensitized solar cells (DSSCs), offering enhanced light absorption and improved charge transport. This review comprehensively examines recent advancements in PANI-TiO_2 composite-based DSSCs, focusing on synthesis strategies, morphological modifications, and interfacial engineering. This review analyses the influence of TiO_2 and PANI nanostructures, doping, and surface modifications on device performance. Interfacial engineering, crucial for efficient charge transfer and reduced recombination, is also discussed, along with the use of electrochemical impedance spectroscopy (EIS) for performance analysis. While significant progress has been made, challenges related to PANI stability and scalable production remain. Future research should focus on developing stable composites, novel dyes, and optimized interfaces to achieve high-efficiency DSSCs for practical applications.

Keywords: Polyaniline; TiO_2; Dye-Sensitized Solar Cells.

VERTICAL SPIN VALVE PERFORMANCE OF COBALT LOADED POLYPYRROLE SYSTEM

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Abstract:

In this study, we report the synthesis, characterization, and magnetic properties of a Cobalt-loaded Polypyrrole (PPy) system, designed for spintronic applications. Cobalt nanoparticles were successfully integrated into the PPy matrix through an ex-situ method. Magnetoresistance studies demonstrated a negative MR value, suggesting that the PPy matrix functions as a spin filter, altering the spin polarization of the cobalt electrodes. The hysteresis loop measurements revealed typical ferromagnetic behavior, with an increase in the area under the curve at low

temperatures, indicating enhanced magnetic ordering. These findings suggest that the Cobalt-loaded PPy system holds promise for use in spintronic devices such as magnetic sensors and memory storage systems, where spin-polarized transport and temperature-dependent magnetic properties are critical.

***Keywords*:** Vertical Spin Valve; Cobalt; Polypyrrole

SYNTHESIS AND SPECTROSCOPIC CHARACTERIZATION OF REDUCED HYDRAZONES OF ISONIAZID

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Abstract:

In this study, we successfully synthesized reduced hydrazones of isoniazid using sodium borohydride ($NaBH_4$) as a reducing agent. The reduction process proceeded efficiently, yielding high-purity compounds. Structural characterization via Infrared (IR) spectroscopy, Nuclear Magnetic Resonance (NMR) spectroscopy, and Mass Spectrometry (MS) confirmed the successful reduction. Notably, the presence of NH peaks at 11.5–12 ppm and 8–9 ppm, along with CH_2 signals in the 2.5–3.5 ppm range in the NMR spectra, validated the reduction of hydrazones. This structural modification enhances the chemical versatility of isoniazid derivatives, potentially improving their pharmacological properties. Given the well-established antibacterial and antitubercular activities of isoniazid, these reduced hydrazones may exhibit promising biological applications. Ongoing studies focus on evaluating their pharmacological efficacy and mechanistic interactions with biological targets. This research offers valuable insights into isoniazid derivative modifications, contributing to the development of novel bioactive compounds in medicinal and pharmaceutical chemistry. Keywords: Isoniazid, reduced hydrazones, sodium borohydride, etc.

MORPHOLOGICAL STUDY OF CMC –ZN^{2+} SYSTEM

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Abstract:

Physicochemical interaction between a metal and its environment results in changes in the properties of the metal and this may often lead to impairment of the function of the metal, the environment, or the technical system of which these form a part. Chemical action causes destruction of the surface of a metal by oxidation or chemical combination. Corrosion is also caused by reduction or chemical combination. Also it is caused by reduction of the electrical efficiency between the metal and a contiguous substance or by the disintegrating effect of strong electrical currents or ground return currents in electrical systems. The latter is known as electrolytic corrosion steel, when exposed to an industrial atmosphere, reacts to form the reaction product rust of approximate composition $Fe_2O_3.H_2O$, which, being loosely adherent, does not form a protective barrier that isolates the metal from the environment; the reaction thus proceeds at an approximately linear rate until the metal is completely consumed. Copper, on the other hand, forms an adherent green patina

corresponding approximately to bronchantite, $CuSO_4$ $3Cu(OH)_2$, which is protective and isolates the metal from the atmosphere.

Atomic force microscopy (AFM) is a powerful technique for gathering of roughness statistics from a variety of surfaces. AFM is becoming an accepted method for investigation of roughness. The two dimensional (2D), three dimensional (3D) AFM morphologies and the AFM cross-sectional profile for polished aluminium metal surface (reference sample), aluminium metal surface immersed in well water (blank sample) and aluminium metal surface immersed in well water containing 250 ppm of CMC and 25 ppm of Zn^{2+} at pH11.

AFM image analysis was performed to obtain the average roughness, Ra (the average deviation of all points roughness profile from a mean line over the evaluation length), root-mean-square, Rq (average of the measured height deviations taken within the evaluation length and measured from the mean line) and the maximum (P-V) height values (largest to single peak-to-valley height in five adjoining sampling heights). Rq is much more sensitive than Ra to large and small height deviations from the mean. The Rq, Ra and P-V values for aluminium metal surface immersed in different environment were studied. Also the increase in Rq, Ra, and P-V values for aluminium immersed in well water in the presence of inhibitors, which are somewhat greater than the Rq, Ra, and P-V height values of polished aluminium surface, confirms the presence of the film on the metal surface, which is protective in nature.

Keywords: CMC, Aluminium, roughness, corrosion.

GREEN SYNTHESIS OF NICKEL OXIDE NANOPARTICLES AND NANOCOMPOSITES AND ITS CHARACTERIZATION, PHOTOCATALYTIC DEGRADATION AND ANTIMICROBIAL EVALUATION

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Abstract:

In this study, the researcher has taken NiO nanoparticles which are eco-synthesized by using the green method. Similarly, the MgO nanoparticles are synthesized by using the green way. Then, both of the synthesized nanoparticles are combined by using the sonication method to synthesize the NiO-MgO nanocomposites in varying ratios (Eg.1:1, 1:2 etc.). Thus, the synthesized nanomaterials and the nanocomposites are characterized by using certain techniques such as UV-Vis, FTIR, XRD, BET, SEM-EDX and TEM. Thereafter, they are applied for the antimicrobial activity. The UV-Vis Spectroscopy results into the maximum wavelength and provides the band gap of the synthesized nanomaterials and nanocomposites. The FTIR technique provides the information regarding the various functional groups which are present in the nanoparticles and nanocomposites. The crystalline nature of the nanomaterials and the nanocomposites is verified by the XRD analysis. The SEM analysis highlighted the aggregation of the particles in the synthesized nanomaterials and nanocomposites. The surface area is assessed by the BET analysis. While TEM analysis provides the morphology of the synthesized materials. Finally, the antimicrobial evaluation is done to show the antimicrobial efficiency of the synthesized nanomaterials against the harmful bacteria and fungi.

Keywords: Nanomaterial, Nanocomposites, Green synthesis, Antimicrobial activity.

STRUCTURAL CHARACTERIZATION OF GLASS PREPARED USING BIOMASS FLY ASH

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Abstract:

In glass composition silica is a one of the main component. It is important to find out the sources of silica other than sand. Biomass ash can be explore as a source of silica for glass formation. The glass prepared from biomass ash as raw materials shows some interesting properties. Glass matrix using glass compositions based B_2O_3–ZnO added with biomass ash (BA) were prepared by melt-quenching technique, and their physical, transport and structural properties were studied. The physical properties such as density and molar volume were calculated and discussed. The elastic moduli, Poisson's ratio, Debye temperature, acoustical impedance and micro hardness have been estimated based on pressure-controlled ultrasonic technique at 4 MHz frequency. It was found that the addition of biomass ash results in an increase of elastic constants, Debye temperature and micro hardness of the prepared glass. Vickers hardness tester was also applied to determine micro hardness of the glass. The values of micro hardness obtained from both techniques were compared and a good correlation was observed. Biomass ash as a source of silica shows prominent changes in transport properties of glass matrix. Moreover, the internal structural units of the glass samples have been estimated by FTIR. XRD spectroscopy was applied to confirm the amorphous nature in the glasses.

Keywords: Biomass fly ash, Glass, Structural properties.

ORGANOSULFUR COMPOUNDS: NEXT GENERATION EMERGING PLAYERS

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Abstract:

Synthesis and stabilization of organic radical ions continues to attract immense interest due to their multi-faceted applications as panchromatic/near infrared (NIR) probes, batteries, conductors, magnets, and for the fundamental understanding of eT reactions. In this context, multifaceted and inherently electron-deficient arylene diimides are attractive as these can be utilized to synthesize diverse radicals.

Herein, we have synthesized different classes of Naphthalene diimide (NDI)/ Perylene diimide (PDI)-based molecular systems, which have one/two/three S atoms at the imide positions. In class I, thionated NDIs without core groups are considered, while in class II and III, thionated NDIs are substituted at the core positions with halogen atoms or cyano groups or chalcogen atoms. In class IV, we have studied mono-/bis-thionated PDIs with halogen atoms at the 2,7-baypositions. Gratifyingly, we have also isolated two pairs of thionated PDI regioisomers, which exhibited subtle differences in their redox and opto-electronic properties. Importantly, with this study, radical anions of core-/bay-substituted thionated arylene diimides have been investigated for the first time. The generated radical anions formed from these classes of molecules are diversely colored, e.g., brown, purple, violet, blue or intense green.

The doublet–doublet transitions were found to be highly red-shifted in all the thionated radical anions. The half-life of these radical anions could be significantly increased e.g., by up to tens of folds, based on the degree of thionation and the core-/bay-substitutions. We believe that these persistently stable, easy to generate radical anions can offer promise in redox/photo catalysis, as NIR absorbers, and halogen-bonding driven self-assembly, etc.

STUDY OF STRUCTURAL PROPERTIES AND MAGNETIC SUSCEPTIBILITY WITH THE EFFECT OF SINTERING TEMPERATURE ON $PbTiO_3$

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Abstract:

Lead titanate $PbTiO_3$ nano-powders have been synthesized using wet chemical method. Effects of synthesis conditions annealing temperature (500^{o}C - 700^{o}C), annealing time (4 hr.) and on the phase formation, morphology and magnetic properties were studied. The produced lead titanate powders were investigated using X-ray diffraction (XRD), Transmission electron microscope (TEM) and hysteresis loop. The results obtained showed that pure single tetragonal $PbTiO_3$ phase was obtained for thermally treated precursors at 600^{o}C with annealing time 4 hr. The crystallite size of the pure $PbTiO_3$ is in the range between 20.48 to 32.84 nm. TEM micrographs shows that sintering temperature have significant change in the morphology of the produced lead titanate powder. The magnetic properties show decrease along with increasing sintering temperature. The magnetic properties of lead titanate have been confirmed on the basis of the hysteresis loop and the magnetic susceptibility of the material varied with the temperature.

Keywords: Wet Chemical Route, $PbTiO_3$, XRD, Magnetic properties, Hysteresis loop.

SYNTHESIS AND CHARACTERIZATION OF MACROCYCLIC HYDRAZONES DERIVED FROM OXALYL DIHYDRAZIDE

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Abstract:

This study investigates the synthesis and characterization of macrocyclic hydrazones derived from oxalyl dihydrazide. The synthesis involves a condensation reaction between oxalyl dihydrazide and 4-hydroxybenzaldehyde under controlled conditions, leading to the formation of macrocyclic hydrazones. The reaction was carried out in solvents such as ethanol, with or without using acid/base catalysts to promote cyclization. Upon completion, the products were purified through recrystallization and characterized using a variety of techniques, including Infrared Spectroscopy (FTIR), Nuclear Magnetic Resonance (NMR), Ultraviolet-Visible (UV-Vis) Spectroscopy, and Mass Spectrometry. The FTIR spectra confirmed the presence of (-C=N-NH2) key functional groups at frequency of range 1590 -1610 cm-1, while the NMR resonance signal observed at 8-9.5 ppm for the -CH=N- proton indicates the formation of a C=N double bond, characteristic of the hydrazone linkage. This observation, coupled with other spectral data, substantiates the successful synthesis of the hydrazone compound. UV-Vis spectroscopy revealed the electronic properties of

the synthesized hydrazones and mass spectrometry confirmed the molecular weight. The results demonstrate the successful formation of macrocyclic hydrazones with structures, which exhibit potential for applications in organic synthesis, material science, and pharmaceutical development due to their unique chemical properties.
Keywords: Macrocyclic hydrazone, oxalyl dihydrazide, 4-hydroxybenzaldehyde etc.

PROTOX ACTIVITY

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Abstract:

Cestrum Diurnum, a plant species rich in phytochemicals, has been traditionally used in folk medicine for its therapeutic properties. The present study aims to analyze the phytochemical composition and protox activity of Cestrum Diurnum. The phytochemical analysis revealed the presence of alkaloids, flavonoids, phenolics, terpenes, glycoside , anthrocynin and saponins which are known for their medicinal properties. The protox activity of the extracts was evaluated using an in vitro assay, which showed a significant inhibition of protox activity.

STUDY WATER QUALITY PARAMETERS METAL IONS Ca, Cd, Na AND Pb

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Abstract:

Water Quality can be defined as the chemical, physical and biological characteristics of water, usually in respect to its suitability for a designated use. Water can be used for recreation, drinking, fisheries, agriculture or industry. Each of these designated uses has different defined chemical, physical and biological standards necessary to support that use. The study involves the Atomic Absorption Analysis of four selected heavy metal like Ca, Cd, Na and Pb.
Keywords: Atomic Absorption Spectrophotometer, Parameter, Ca, Cd, Na and Pb.

THE GROWING CHALLENGE OF ELECTRONIC WASTE MANAGEMENT AND SUSTAINABLE SOLUTIONS

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Abstract:

The rapid advancement of technology and increasing demand for electronic products have led to a surge in electronic waste (e-waste) generation. Over the next five years, global e-waste production is expected to reach 44.4 million metric tons, with the electronics recycling market projected to grow to $65.8 billion by 2026. However, e-waste management remains inadequate in many developing countries, where only 17.4% is properly collected and recycled. Poor waste treatment poses serious environmental and health risks while depleting valuable natural resources. E-waste contains numerous recoverable materials, including metals and rare earth elements, which can be repurposed for renewable energy technologies. Efficient recycling can reduce reliance on non-renewable resources and minimize

environmental damage. However, many regions lack structured recycling programs, leading to hazardous informal practices such as open burning and acid leaching. Corporate social responsibility (CSR) initiatives have played a role in integrating informal recycling sectors into formal management systems. Additionally, proper e-waste management significantly reduces greenhouse gas emissions. The CO_2 reductions achieved through recycling can be monetized via carbon trading, creating economic incentives for sustainable waste management. This paper provides an overview of e-waste classification, recycling techniques, and the use of high-recycled value-added (HAV) materials in green energy technologies. Implementing effective recycling methods and structured waste management systems is crucial for environmental sustainability and the transition to a circular economy.
Keywords: E-waste, Global market, Recycling, Metal recovery, Supercapacitor, Hydrometallurgy, Energy conversion, green hydrogen, Energy storage.

THE PHOSPHORS DOPED WITH EUROPIUM CATIONS & STUDY OF LUMINESCENCE PROPERTIES WITH MODIFICATION FOR REMARKABLE APPLICATIONS

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Abstract:

These days, luminescence with a variety of applications in the fields of optics and medicine is more interested in materials with garnet nanostructures rich in lanthanides. Because garnet nanostructured phosphor is more efficient and environmentally benign, it is quickly advancing in the disciplines of optics and luminescence. It is more likely that the garnet phosphor has a cubic structure. Because of their structural flexibility, long disintegration time (short decay rate), and quantum efficiency, yellow colored light to white light discussion is the most appealing issue for scholars. Defect control greatly improves the durability of these lighting devices (w-LEDs or pc-w-LEDs). In this research, we used lanthanide trivalent electron ions as activators and YAG as the host. The concentration of activators determines how much light is emitted. Both the dopant (activator) and the host are in charge of the materials' excitation and emission wavelengths. Using an instrument called a spectrophotometer, the materials' luminescence characteristics were examined. Our primary emphasis is on the luminescence characteristics and uses of yttrium aluminum garnet (YAG) doped with different trivalent dopants from lanthanides. Yellow phosphor is referred to as YAG:Ce^{3+}. Over the past few decades, novel garnet materials have been created. However, we made adjustments and used appropriate calculations to increase the materials' efficiency. We made changes to the crystal cite to see how the absorption and emission measurements changed. Finally, we will discuss how the heating temperature affects the intensity of luminescence.
***Keywords*:** Garnet Phosphor, Luminescence, Nanomaterials, Europium cations.

IMPACT OF DOUBLE INTEGRALS IN ENGINEERING

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Abstract:

In engineering, double integrals serve as important fundamental mathematical tools that facilitate the analysis and computation of quantities dependent on two variables over a specified region. Their applications spread across multiple engineering branches, enhancing our ability to address different and difficult problems and improve system designs in many ways. In structural engineering, double integrals are most needed for determining the center of mass, moments of inertia, and stress distributions, leading to the development of safer and more efficient structures. In fluid dynamics, they make sure the precise calculation of fluid flow rates, pressure distributions, and other key parameters critical to optimizing fluid systems. The field of thermodynamics benefits from double integrals by allowing engineers to compute heat transfer rates and temperature distributions, which are important for the design of advanced thermal systems. Moreover, in electromagnetics, double integrals are important to derive electric and magnetic field distributions, ensuring the effective design of electronic components and systems. Lastly, in signal processing, double integrals play a vital role in analyzing and processing multi-dimensional signals, driving progress in communication and multimedia technologies. This paper delves into the profound impact of double integrals in engineering, exploring their diverse applications and underscoring their irreplacability in modern engineering practices.

***Keywords*:** Double integrals, engineering applications, structural engineering, fluid dynamics, thermodynamics, mathematical modeling, optimization.

DEVELOPMENT OF SUSTAINABLE POLYMER MATERIALS FROM RENEWABLE RESOURCES

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Abstract:

The increasing demand for sustainable materials has driven the development of polymer materials from renewable resources. This study focuses on the synthesis and characterization of sustainable polymer materials from plant-based biomass, such as corn starch and sugarcane bagasse. A novel biodegradable polymer was synthesized using a combination of enzymatic and chemical catalysis. The resulting polymer was characterized using various techniques, including FTIR, NMR, and TGA. The results show that the synthesized polymer exhibits excellent biodegradability, thermal stability, and mechanical properties. The study highlights the potential of renewable resources in the development of sustainable polymer materials, providing a promising alternative to traditional fossil-based polymers.

Keywords: Polymer, FTIR, NMR, TGA.

A REVIEW: METHODS OF SYNTHESIS AND CHARACTERIZATION OF IRON DOPE SILVER NANOPARTICLE AND ITS APPLICATION

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Abstract:

Iron-doped silver nanoparticles (Ag-Fe NPs) have attracted increasing attention due to their enhanced magnetic, optical, and catalytic properties, making them highly valuable in medicine, catalysis, and environmental applications. The addition of iron to silver nanoparticles significantly improves their performance, broadening their potential in fields like antimicrobial treatments, drug delivery, and pollution control. This review explores various synthesis methods-including chemical reduction, sol-gel, green synthesis, laser ablation, co-precipitation, electrochemical, hydrothermal, and microemulsion techniques-discussing their principles, benefits, and challenges. Additionally, key characterization techniques such as X-ray diffraction (XRD), transmission electron microscopy (TEM), Fourier-transform infrared spectroscopy (FTIR), and advanced methods like X-ray photoelectron spectroscopy (XPS) and Mössbauer spectroscopy are examined. By comparing different synthesis and characterization approaches, this review provides insights into optimizing Ag-Fe NPs for specific applications. It also addresses key challenges such as nanoparticle stability, toxicity concerns, and large-scale production, aiming to contribute to the advancement of nanotechnology and its real-world applications.

MOLECULAR INTERACTION STUDY OF SUBSTITUTED THIOPYRIMIDINES IN THE BINARY MIXTURE

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Abstract:

In the present investigation, some important acoustical parameters, such as ultrasonic velocity(U), intermolecular free length(Lf), specific acoustic impedance(Z), relative association(RA) of substituted thiopyrimidines in 70% of DMF+water mixture at 300K have been studied. With the help of experimental data, the effect of concentration of solute on different acoustical parameters in DMF-water mixtures and deviation of acoustical parameter with the change in concentration has been studied. Pyrimidine moiety is an important class of nitrogen containing heterocycles and is widely used as a key building block for pharmaceutical agents. Its derivatives exhibit antibacterial, antifungal, analgesic, calcium antagonist, anti-inflammatory and anti-tumor activity. In addition, several marine natural products with interesting biological activities containing pyrimidine core have recently been isolated. Most notably among these are the batzelladine alkaloids A and B which inhibit the binding of HIV envelope protein gp 120 to human CD4 cells.

APPLICATIONS OF TRIPLE INTEGRALS IN ENGINEERING

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Abstract:

This paper presents a comprehensive study of triple integrals, extending the conventional understanding of volumetric integration to encompass a broader class of functions and domains. We introduce a novel framework for defining and evaluating these integrals, particularly focusing on cases where the integrand or the region of integration exhibits discontinuities, singularities. Utilizing concepts from measure theory and functional analysis, we develop techniques for establishing the existence and uniqueness of total triple integrals under relaxed regularity conditions. A significant contribution is the establishment of a generalized total triple integrals. We further explore applications of these integrals in physics, specifically in modelling heterogeneous materials and non-equilibrium systems, where conventional integration methods prove inadequate. Triple integrals play a crucial role in various digital applications, particularly in fields like computer graphics, image processing, machine learning, and signal processing. These integrals enable the computation of volumetric properties, aiding in tasks such as 3D rendering, object recognition, and spatial data analysis. In computer graphics, triple integrals help simulate realistic lighting, shading, and textures. In image processing, they assist in reconstructing 3D models from medical scans and volumetric data. Machine learning utilizes triple integrals in probability density estimation and feature extraction from multidimensional datasets. Other applications include 3D scanning, AR/VR development, and robotics, where they contribute to path planning and spatial mapping. Overall, triple integrals are indispensable in advancing digital technologies that rely on 3D data representation and analysis.

Keywords: Triple Integrals, AR/VR development, Spatial Mapping, Machine Learning, Computer Graphics.

APPLICATIONS OF MATRICES IN ELECTRONICS AND ELECTRICAL ENGINEERING

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Abstract:

Matrices play a crucial role in the field of electronics and electrical engineering, providing an essential mathematical framework for solving complex problems. They are widely utilized in circuit analysis, signal processing, control systems, and power systems. In circuit analysis, matrices are used to solve systems of linear equations representing electrical networks, allowing efficient calculation of voltage and current. In signal processing, matrix operations enable the transformation and filtering of signals for various applications, including communication systems. Additionally, matrices are employed in power system analysis to solve load flow equations and optimize system performance. Furthermore, matrices aid in digital image processing, essential for visual data manipulation in electronics. Overall, the versatility of matrices in solving real-world engineering problems underscores their importance in advancing modern electrical technologies.

***Keywords*:** Matrices, Electronics, Electrical Engineering, Circuit Analysis, Signal Processing, Control Systems, Power Systems, Linear Equations, Optimization.

PHYTOCHEMICAL-MEDIATED SYNTHESIS OF COPPER NANOPARTICLES: A STEP TOWARDS SUSTAINABLE NANOTECHNOLOGY

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Abstract:

The green synthesis of nanoparticles has emerged as a sustainable alternative to conventional chemical and physical methods, reducing environmental hazards and promoting biocompatibility. This study explores the phytochemical-mediated synthesis of copper nanoparticles (CuNPs) using plant extracts as natural reducing and stabilizing agents. The bioactive compounds in plant extracts facilitate the efficient reduction of copper ions, leading to the formation of stable CuNPs without the use of toxic chemicals. The synthesized nanoparticles were characterized using UV-Vis spectroscopy, X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) to determine their structural, morphological, and functional properties. The results confirm the formation of well-dispersed CuNPs with nanoscale dimensions. Furthermore, the synthesized CuNPs exhibited significant antimicrobial, antioxidant, and catalytic activities, demonstrating their potential applications in biomedical, environmental, and industrial fields. This study highlights the advantages of phytochemical-assisted nanoparticle synthesis as a cost-effective and environmentally friendly approach to advancing nanotechnology.

Keywords: Copper nanoparticles, Green synthesis, Phytochemicals, Plant extracts.

A REVIEW ON SYNTHESIS OF QUINOLINE AND IT'S DERIVATIVES

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Abstract:

Quinolines abstract have become important compounds because of their variety of applications in medicinal, synthetic organic chemistry as well as in the field of industrial chemistry. In recent years there are greater societal expectations that chemists should produce greener and more sustainable chemical processes. This review article gives information about the green and clean syntheses using alternative reaction methods for the synthesis of quinoline derivatives. The article includes synthesis by microwave, using clay or some other catalyst which could be recycled and reused, one-pot reaction, solvent-free reaction conditions, using ionic liquids, ultrasound promoted synthesis and photocatalytic synthesis (UV radiation).

Keywords: Quinolines, sustainable, one-pot reaction, biological activity, Quinoline derivatives.

DEVELOPMENT, NUTRITIONAL COMPOSITION ANALYSIS, SENSORY EVALUATION AND SHELF LIFE STUDY OF IRON AND PROTEIN-RICH LADDOO AS A SUPPLEMENT FOR MARTIAL ARTS ATHLETES

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Abstract:

Martial arts practitioners undergo intense physical training that requires specialized nutrition for optimal performance, muscle recovery, and overall health. Among the key nutrients that support athletic performance, protein and iron are crucial, with deficiencies in these nutrients potentially impairing strength, energy levels, and recovery. This study aimed to develop a protein- and iron-rich laddoo, a traditional Indian sweet snack, as a dietary supplement tailored for young martial arts players. The laddoo incorporated nutrient-dense ingredients such as sesame seeds, garden cress seeds, roasted bengal gram, black raisins, skimmed milk powder, cocoa, sugar, and ghee. The nutritional composition of the laddoo was analysed to determine its protein and iron content, along with other macro and micronutrients. Sensory acceptability and shelf-life stability were evaluated. Nutritional composition analysis revealed that the laddoo provided 15.09 % protein, 10.6 mg iron, and 417.16 kcal of energy, along with other vital nutrients. Sensory evaluation showed high acceptability with a mean score of 10 for taste and flavour. The shelf-life study indicated that the laddoos maintained their quality for up to 30 days under ambient storage conditions. The results suggest that this fortified laddoo could serve as a convenient, nutrient-dense, and traditionally acceptable source of nutrition for martial arts athletes, supporting muscle recovery and overall performance.

Keywords: Iron-rich laddoo, protein, martial arts, nutritional composition, sensory evaluation, shelf life, supplementation, traditional food.

POLYBORATE ASSISTED SYNTHESIS OF PYRAZOLONE DERIVATIVES BY KNOVENAGEL CONDENSATION

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Abstract:

Treatment of mixture of 3-methyl-1-(2,4-dinitrophenyl)-1H-pyrazol-5(4H)-one 1 with diversity of aromatic aldehyde using Polyborate assisted synthesis of Pyrazolone derivatives gave products in good yield. The mild Lewis acidity, crystalline solid nature, stability and recyclability are significant features of the catalyst. The solvent-free condition, clean reaction profile, inexpensive and non-toxic catalyst, operational simplicity, good to excellent product yields, reduced reaction time and applicability to wide range of substrate are crucial features of this protocol. Characterization of all the formed derivatives emphasized by melting point determination, NMR data in addition to their mass spectra

Keywords: Polyborate assisted, Pyrazolone, Antimicrobial activity.

DEEP EUTECTIC SOLVENTS: A REVIEW OF THEIR PROPERTIES APPLICATION AND FUTURE DIRECTION

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Abstract:

Deep eutectic solvents (DESs) are a class of ionic liquids that have gained significant attention in recent years due to their unique properties and potential applications. DESs are formed by the combination of a hydrogen bond donor and a quaternary ammonium salt, resulting in a eutectic mixture with a melting point lower than that of the individual components. Deep eutectic solvents (DESs) have emerged as a promising class of sustainable solvents, offering a viable alternative to traditional organic solvents. DESs are eutectic mixtures of two or more components that exhibit a significant depression in melting point, resulting in a liquid phase at room temperature. This unique property enables DESs to dissolve a wide range of compounds, including biomolecules, polymers, and metal oxides.

FENUGREEK SEED: AN EFFECTIVE MEDICATION FOR SPONDYLOSIS AND BONE RELATED PROBLEM

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Abstract:

Medicinal plants have a huge history of usage having low side effects. These plants tend to show promising results in prevention and treatment of diseases for example diabetes, atherosclerosis, hypertension, cardiovascular diseases and cancer. The purposes are not only limited to these. Medicinal plants also have the ability to minimise drug induced harmful effects, heavy metals and other Toxicities. Fenugreek, or Trigonella foenum-graecum L., is one of the oldest plants used in modern medicine. The therapeutic use of fenugreek has been highlighted by substantial pharmacological and clinical data of various researchers. More than 100 phytochemicals, primarily polysaccharides, saponins, alkaloids, phenolic acids, and flavonoids, have been isolated from fenugreek seeds up to this point. Seed powder is used as a herbal remedy to cure diabetes, acts as a good conditioner for hair, and lessens hair loss. It is helpful for watt (bone coldness), lowers cholesterol, and works well for arthritis joint pain and spondylosis. It is a rich source of calcium source. In ayurveda, fenugreek seeds are significant mostly for watt. Knee joint discomfort can be treated by grinding methidana into a powder and mixing in the equal amount of jaggery. Make a laddu the size of a betelnut and eat one every day to feel better because it contains iron and calcium. Another use of Methidana, ajwain, and jeera are fried and then ground into a powder one teaspoon can be taken at night with a hot water to boost the body's resistance and weight loss. For spondylosis and back pain, soak 2 teaspoons of methidana in a cup of water in the evening, add a cup of milk exactly 12 hours later, in morning boil the mixture until only 1 cup is left, and then consume on an empty stomach for one month. And after two months you forgot that you had spondylosis. This is a very effective remedy for back pain, particularly for spondylitis, which was used in 1920 for the "Manmodi" (vertebral problem) epidemic.
Keywords: Fenugreek, methidana, alkaloids, flavonoids.

ORGANIC FUNCTIONALIZED SILICA NANOPARTICLES AS REINFORCING AGENTS IN POLYMER COMPOSITES

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Abstract:

The fusion of organic – functionalized silica nanoparticles obtained from rice husk ash (RHA) into polymer composites is a sustainable and economical approach for enhancing material properties. Rice husk is an agricultural bi product and a low cost, abundant source of silica. This promotes environmental sustainability through waste utilization. The extracted silica nanoparticles exhibit high strength and significantly improvise the mechanical properties such as tensile strength, stiffness and impact resistance of polymer matrices. Due to its Nano scale it provides large surface area, promotes strong interactions with the polymer that leads to improved dispersion and reinforcement. Organic functionalization of SiO_2 nanoparticles further enhances the compatibility with polymer matrices by modifying their surface with specific organic groups, reducing agglomeration, and strengthening interfacial adhesio. This results in polymer composites with superior mechanical, thermal, and barrier properties. These advanced materials have promising applications across multiple industries, including automotive, aerospace, construction, packaging, and biomedical fields. The use of RHA-derived silica nanoparticles as reinforcing agents aligns with the principles of sustainability and resource efficiency, making them a viable alternative to conventional fillers.

***Keywords*:** Functionalized, sustainable, dispersion, agglomeration.

DESIGNING OF HIGHLY ACTIVE G-C_3N_4/NIO-ZNO PHOTOCATALYST TOWARDS HIGH PHOTOCATALYTIC PERFORMANCE UNDER SUNLIGHT RADIATION AND ANTIBACTERIAL STUDY

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Abstract:

An efficient photocatalytic composite g-C_3N_4/NiO-ZnO has been successfully synthesized by coupling graphitic carbon nitride (g-C_3N_4) with nickel oxide-zinc oxide nanoparticles via a cost-effective chemical co-precipitation and sonication method. The synthesized nanocomposites were characterized using sophisticated analytical techniques to evaluate the catalyst's morphological, structural, and surface chemical properties. The produced nanocomposites were explored by using XRD, FTIR, FE-SEM, and UV–vis spectroscopy. The nanocomposites employed for photocatalytic degradation of Crystal Violet cationic dye in eco-friendly solar radiation exhibited remarkable photocatalytic efficiency, achieving 98% degradation of crystal violet within 60 minutes across various concentrations. Antifungal and antibacterial properties were also assessed. The disk diffusion technique was used to test against Gram-positive and Gram-negative microbes. Antibacterial performance against *E. coli*, *P. mirabilis*, *Staphyllococcus aureus*, *Bacillus subtilis*, and antifungal performance against *Candida albicans*, *Aspergillus niger* species were used. The obtained results revealed that the synthesized g-C_3N_4/NiO-ZnO can play a vital role in the destruction of pathogenic bacteria, the degradation of dyes and the activity of antifungal agents in the bioremediation of industrial and domestic waste.

Keywords: g-C_3N_4/NiO-ZnO, Photocatalysis, Antibacterial, Antifungal activity.

ROLE OF NANOMATERIALS IN ENHANCING EFFICIENCY OF DYE-SENSITIZED SOLAR CELLS

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Abstract:

Dye-sensitized solar cells (DSSCs) have attained substantial curiosity in the field of renewable energy, predominantly due to their affordability, easy manufacturing methods and property of converting solar energy into electrical power. The efficiency of DSSCs is significantly determined by the materials utilized in the photoanode, especially the nanoparticles that constitute the mesoporous semiconductor layer. The nanomaterials are sensitized with a dye molecule in order to exploit solar energy. The exceptional stability and electron mobility of TiO_2 make it most commonly used material as photoanode for However, other nanoparticles like ZnO, CuO, and carbon-based materials are also extensively studied as a photoanode for DSSCs. The bandgap of metal oxide nanoparticles like TiO_2 restricts the utilization of very small portion of solar energy. The ease of fabrication and the ability to perform well in low-light conditions make DSSCs advantageous over the traditional solar cells. Nanomaterials play important roles in the photoelectric conversion of DSSCs, for example light absorption, charge carrier transport, stability and interlayer transmission bridges. The high surface area and small size of the nanoparticles favour the suppression of the charge recombination. Dye absorption is also enhanced by using highly porous nanoparticles as a photoanode. By improving the electron transport, nanoparticles aid rise the overall efficiency of the cell. Recent studies are focussing on the development of new types of nanoparticles and composites that further enhance DSSC performance. For example, S nanoparticles-incorporated iron-doped titanium oxide (Fe/TiO_2) has been investigated as a potential photoanode for DSSCs with great performance. However, there are still challenges to be addressed. The fabrication of DSSCs using nanomaterials can be complex and may involve high-cost synthesis methods. There is also ongoing research into optimizing the balance between light absorption, charge transport, and stability to ensure that DSSCs can achieve efficiencies on par with other commercially viable solar technologies.

RHIZOSPHERIC MYCOFLORA INVESTIGATION OF *TERMINALIA ARJUNA* (ROXB.) FROM SINDKHED RAJA AND DEULGAON RAJA DIST. BULDHANA

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Abstract:

The present study was conducted to inspect the soil mycoflora of Terminalia arjuna. Rhizosphere the soil region nearest to plant root system. in habits various microorganisms varying in their community structure and diversity. *Terminalia arjuna* (Roxb.) is a unique plant species belonging to the family Combretaceae,

having high medicinal properties and also provide habitat for the growth of different microfungi. The Buldhana district in Maharashtra state is known to have wide variety of micro fungi, yet little is known about them and its occurrence is also affected by climate change. It is necessary to look into these fungi for changes in their communities. The objective of the present research work is to investigate fungal pathogens harboring from the rhizosphere of the *Terminalia arjuna* (Roxb.) from different locations of Buldhana district. In this current rhizospheric investigation from 20 isolates, total 10 fungal species from 5 genera like *Alternaria, Aspergillus, Curvularia, Fusarium* and *Penicillium* were isolated by the serial dilution method and culture method (Potato Dextrose Agar media). The morpho-taxonomy of isolated fungal pathogens was done with the help of relevant literatures.

***Keywords*:** Mycoflora, soil, study, *Alternaria, Terminalia arjuna,* identification.

INNOVATION FOR CHARACTERIZATION OF THE RED EMISSION GARNET PHOSPHORS $Y_3MG_2ALSI_2O_{12}$ BY AI AGENTS

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Abstract:

Artificial intelligence agents may be greatly enhanced sensitivity and spatial resolution of garnet phosphor-converted laser diodes as light sources. Nevertheless, phosphor materials' limited temperature resistance and low external quantum efficiency significantly limit pc-LED performance. Using the sol-gel combustion process, the red-emitting garnet phosphors $Y_3Mg_2AlSi_2O_{12}$ were produced. In order to better match the XRD peaks of the sample with the provided standard, the artificial intelligence agents may alter and enhance the process. We contrasted the outcomes produced by AI agents to those of the more conventional, calculation-based approach. AI agents that are mathematically modeling are contrasted to theoretical ones. The excitation and emission spectra were reported at 342 nm and 611 nm, respectively, according to the PL findings.

Keywords: AI gents, Garnet phosphors, $Y_3Mg_2AlSi_2O_{12,}$ red emitting phosphor.

ANALYSIS OF MICRO PLASTIC IN CONTAMINATED MAHANADI AND ITS TRIBUTARY KATHAJODI RIVER WATER AT CUTTACK CITY AND ITS EFFECT ON FISH SPECIES BY MICRONUCLEUS ASSAY AND HAEMATOLOGICAL PARAMETERS STUDY

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Abstract:

Mahanadi and it's tributary Kathajodi river water is highly polluted. Alkalinity, hardness, pH of water has changed in the last few years due to domestic wastes, insecticides, herbicides, industrial wastes, livestock waste, chemical compounds, Swage water, etc. Micro plastic particle quantity increases which causes

haematological and genetic damage to the aquatic ecosystem. Fish are the best biomarkers to find out the threats towards aquatic ecosystem as they show genetic damage and formation of micronucleus due to polluted habitat. Micro plastic particle analysis occurs by evaporation method. Fish species like Labeo rohita, Catia catla, Cirrhinus mrigala, Cirrihinus reba collected from the several stations of Cuttack 20.44°N 85.88°E to 20.46°N -85.89°E area and for Haematological study blood was collected by puncturing the caudal vein. Micronucleus assays done by Gemsa staining. And result shows high frequency micronucleus, DNA damage and changes in haematological condition which indicate high level of pollutants in water of River Mahanadi and Kathajodi Cuttack Odisha.

Keywords: Micro plastic , Evaporation Method, Haematological Study, Micronucleus.

SYNTHESIS AND CHARACTERIZATION OF MAGNESIUM FERRITE ($MgFe_2O_4$) NANOPARTICLES BY SOL-GEL AUTO-COMBUSTION METHOD AND EVALUATION OF THEIR HEMOCOMPATIBILITY FOR BIOMEDICAL APPLICATIONS

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Abstract:

Ferrite nanoparticles are attracting significant interest in biomedical applications due to their magnetic properties, biocompatibility, and potential use in targeted drug delivery, imaging, and hyperthermia therapy. Among them, magnesium ferrite ($MgFe_2O_4$) nanoparticles are specifically promising, as magnesium plays a crucial biological role in cellular metabolism, enzymatic regulation, and neuromuscular function. In this study, $MgFe_2O_4$ nanoparticles were synthesized by the sol-gel auto combustion method and characterized by XRD, FTIR, SEM, EDS. The synthesized particles then evaluated for their hemocompatibility, for the determination of their suitability for biomedical applications. In vitro haemolysis assay was conducted by incubating human red blood cells (RBCs) with different concentrations of $MgFe_2O_4$ nanoparticles ranging from 62–1000 µg/ml, and haemolysis was quantified spectrophotometrically by measuring haemoglobin release at 540 nm. While the positive control exhibited significant haemolysis (OD ≈ 0.35), the negative control and all nanoparticle-treated samples showed no measurable haemolytic activity (OD = 0.00), indicating excellent blood compatibility. These findings demonstrate that $MgFe_2O_4$ nanoparticles are highly haemocompatible and making them suitable for biomedical use. Further investigations in vivo studies, are recommended to ensure their safety for clinical applications.

***Keywords*:** Ferrite nanoparticles, magnesium ferrite, hemocompatibility, haemolysis.

SYNTHESIS OF SUBSTITUTED SCHIFFS BASES BY USING BIO CATALYST LEMON JUICE, ORANGE JUICE AND PINEAPPLE JUICE

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Abstract:

Currently in this laboratory we developed new, easy and convenient green synthetic method which is less hazardous and eco-friendly,. Substituted Schiffs bases

were synthesized by interacting various substituted aldehyde with primary aromatic amine in 1:1 ratio by using bio-catalyst various fruit juices viz. lemon juice, orange juice and pineapply juice on green synthetic approach respectively. Structural determination and justification were done on the basis of chemical tests, elemental analysis spectral studies.

***Keywords*:** Green chemistry, Schiffs bases and fruit juices etc.

TAILORED SnO_2/G-C_3N_4 NANOCOMPOSITES: A SIMPLE CO-PRECIPITATION APPROACH FOR ENHANCED STRUCTURAL AND OPTICAL PROPERTIES

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Abstract:

In this study, we present the synthesis of SnO_2/g-C_3N_4 nanocomposites via a simple co-precipitation method. The structural, morphological, and optical properties of the synthesized materials were thoroughly investigated using X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), Fourier transform infrared spectroscopy (FTIR), and UV-Visible spectroscopy. XRD analysis confirmed the phase purity and absence of impurities in the synthesized nanocomposites. FESEM imaging revealed distinct variations in nanoparticle size and shape among pure SnO_2, g-C_3N_4, and the SnO_2/g-C_3N_4 nanocomposite. Optical characterization demonstrated a band structure within the visible region, with direct optical band gaps determined using Tauc's plot, ranging from 2.39 to 3.7 eV. FTIR spectroscopy identified characteristic Sn–O and C–N vibrational peaks, confirming the successful formation of the heterojunction structure in the nanocomposite. The study highlights the potential for precise control over the morphological and optical properties of SnO_2/g-C_3N_4 using this straightforward synthesis approach, making it a promising material for various catalytic applications.

Keywords: SnO_2/g-C_3N_4 nanocomposite; Co-precipitation synthesis; Heterojunction formation; Optical properties.

THE IMPACT OF GERMINATION TIME ON THE PROTEIN CONCENTRATION IN (TRITICUM AESTIVUM) WHEAT SEEDS

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Abstract:

The nutritional content of food material can make someone healthier. For maintaining overall health, it is important to understand the nutrition content of it. It helps in avoiding the disease and confirms the optimal energy levels. Dietary needs can be fulfilled by consuming the right product at the right time, such as sprouts. Sprouts are the new part of seed that grown from it during its germination. Germinating seed acts as a rich source of protein and fibers. However, protein concentration does vary with germination time. Wheat is a staple food in many cultures and is included in the diet for several reasons. Wheat in the diet can contribute to a balanced and nutritious eating pattern, providing essential nutrients and energy for optimal health. Results showed that there is a significant increase ($P< 0.01$)

in protein content from 24 hrs 0.712 ± 0.038 mg protein to 96 hrs 0.875 ± 0.058 mg per gram of germination of wheat seeds. Understanding the optimal use of natural resources is often overlooked by most of people. Our objective is to elucidate methods for enhancing the effectiveness of utilizing common items. By maximizing the potential of these resources, we can improve our health in various ways.
Keywords: germination, health, nutrition, nutrient deficiencies, protein concentration.

DECIPHERING LEAF SENESCENCE: INVESTIGATING CHLOROPHYLL DYNAMICS IN GREEN AND YELLOW FOLIAGE

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Abstract:

Due to changes in chlorophyll content the leaves of plant start to turn yellow. This can be happening due to the senescence. Senescence is the aging process seen in all living things including plants. This process is controlled by distinct genes termed as Senescence Associated Genes (SAGs) and is enhanced by various factors like the environment and a plant hormone called ethylene. Leaves can age in two ways, one as the plant ages naturally, and the other by darkening. It has been found that certain genes, such as ORE-1, play an important role in this process by inhibiting other genes that keep the chloroplasts (the green parts of plants) healthy. Understanding the molecular mechanisms of leaf senescence is important for improving agricultural practices, crop yield and pliability. The current work highlighted the process of leaf senescence and investigating the chlorophyl and protein content in green and yellow leaf of hibiscus plant.
Keywords: Senescence, hormone, environment, agricultural, aging.

THE INVESTIGATION OF THERMO-ACOUSTICAL BEHAVIOR OF BINARY LIQUID MIXTURES OF BENZENE AND TETRA BUTYL AMMONIUM IODIDE AT DIFFERENT TEMPERATURES

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Abstract:

The study of ultrasonic velocity is crucial for understanding molecular interactions in binary liquid mixtures. in the present study the first liquid is taken is nonpolar and the other two components are ionic liquid in nature. The ultrasonic velocity, density, and viscosity for binary liquid mixtures containing benzene with tetra ammonium iodide has been measured at different temperatures T=301.15k,305.15k,309.15k,313. 15k at different composition of liquid mixture. From these experimental values derives the ultrasonic parameter via impedance, intermolecular free length, adiabatic compressibility, molar volume, free volume and relaxation time. Ionic liquids (ILs) are widely used, therefore experimental study on their physio-chemical properties has increased. This study indicates the importance of the speed of sound in ionic liquids and their mixtures. The Reviewing of relevant theoretical frameworks. This investigation is anticipated to yield valuable insights into subsequent research concerning the physicochemical properties within ionic liquid.
Keywords: Benzene, Tetra Butyl Ammonium Iodide, Molecular Interaction.

PHYTOCHEMICAL ANALYSIS AND PROTOX ACTIVITY OF CESTRUM DIURNUM

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Abstract:

Cestrum Diurnum a plant species rich in phytochemicals, has been traditionally used in folk medicine for its therapeutic properties. The present study aims to analyze the phytochemical composition and protox activity of Cestrum Diurnum. The phytochemical analysis revealed the presence of alkaloids, flavonoids, phenolics, terpenes, glycoside , anthrocynin and saponins which are known for their medicinal properties. The protox activity of the extracts was evaluated using an in vitro assay, which showed a significant inhibition of protox activity.

ECO-FRIENDLY PHOTOCHEMICAL SYNTHESIS OF SCHIFF'S BASE USING ORANGE JUICE AS A GREEN CATALYST

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Abstract:

Schiff's bases are an important class of organic compounds characterized by the -HC=N- bond, formed through the condensation of carbonyl compounds with primary amines, eliminating a water molecule. First synthesized by Hugo Schiff in 1864, these compounds have gained significant importance in heteroacyclic and heterocyclic chemistry due to their stability and diverse applications. Traditionally, Schiff's bases are synthesized by refluxing aldehydes or ketones with amines in alcoholic media, a time-consuming process with low yields. Schiff's bases play a crucial role in organic synthesis and are widely used in pharmaceutical, industrial, agricultural, and biochemical applications. Their metal complexes exhibit significant biological activities, including anticancer, antibacterial, antifungal, anti-HIV, and antiparasitic properties. Additionally, Schiff's bases serve as intermediates in polymer chemistry, catalysis, and material sciences. Furfuraldehyde, a vital aldehyde in biofuel and biochemical production, has been extensively utilized in pharmaceutical and agrochemical industries. Similarly, aniline, hydrazine, and thiourea are valuable precursors in synthetic chemistry. Recent research has focused on developing green and sustainable synthesis methods for Schiff's bases. In this context, researchers have successfully employed eco-friendly catalysts such as orange juice and other natural acids. The present study aims to synthesize Schiff's bases via the reaction of furfuraldehyde with aniline, thiourea, and hydrazine using lemon juice as a green catalyst. Synthesized compounds were characterized using NMR, spectral studies, and elemental analysis. This environmentally benign approach enhances sustainability in organic synthesis, offering efficient alternative to conventional methods.

Keywords- Schiff's bases, heterocyclic, aldehydes, amines, Furfuraldehyde, aniline, eco-friendly catalysts, orange juice, organic synthesis.

THE APPLICATION OF BIOMATERIALS FOR INNOVATIVE SUSTAINABLE DEVELOPMENT

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Abstract:

Biomaterials and sustainable resources are two complementary terms supporting the development of new sustainable emerging processes. In this context, many interdisciplinary approaches including biomass waste valorization and proper usage of green technologies were brought forward to tackle future challenges pertaining to declining fossil resources, energy conservation, and related environmental issues. The sustainable biomaterial is an inter relationship between renewable natural resources and biomaterials and provides us as good prospect for the development of innovative sustainable development. The materials designed and developed to interact with the biological systems are called biomaterials. They are bioactive materials and easily compactable to the human tissue. They show good degree of biodegradability. They are commonly used in medicines, tissue engineering, manufacturing of human body parts and other manufacturing applications. The different common biomaterials are: Ceramic materials, some metals and their alloys, some specific bioactive glass, Polymeric materials and their composites, Biopolymers and their composites, Materials synthesized from animal based origin. The biomaterials are eco-friendly. They are either extracted from different biological resources or manufactured by using the green technology. Till date a number of biomaterials are designed and developed which have successfully applied in different biomedical fields as a potential alternative to the traditional materials. They are successfully used in the medical treatment like cancer therapy, repairing of ligaments and tendons, orthopedic applications, ophthalmic applications for designing contact lenses, wound healing, reproduction therapy of nerve generation, breast implants, and manufacturing of different surgical devices.

***Keywords*:** sustainable biomaterials, biomass precursors, waste valorization, porous carbons, bioplastics.

ASSESSMENT OF GENOTOXIC POTENTIAL OF CARBENDAZIM ON *CHANNA PUNCTATUS* USING MICRONUCLEUS ASSAY

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Abstract:

Pesticides are commonly employed in agricultural innovation to boost crop yields. They also have the potential to contaminate water and soil, causing long-term environmental harm. Pesticides can enter adjacent rivers, lakes, and groundwater through runoff from treated fields, disrupting ecosystems and perhaps endangering aquatic life. This may cause local ecosystems to be disrupted and biodiversity to decline. However, by damaging earthworms, fungus, and beneficial microbes that is essential to the upkeep of healthy soil ecosystems, pesticides can lower soil fertility. Somehow, its excessive exposure does not end with target creatures; it also impacts a number of non-target organisms like beneficial insects like bees, butterflies, and natural pest predators. But the most prominent species to get affected is fish. Since

biodiversity-rich freshwater ecosystems are currently losing biodiversity more quickly than marine or terrestrial ecosystems, making them the most vulnerable habitats on Earth and facing threats from anthropocentrism, fish micronucleus testing has great potential for continuous and effective pollution assessment. In the present study micronucleus assay was used to evaluate the genotoxic potential of the fungicide carbendazim in *Channa punctatus*. Two distinct approaches were used: three dosages of carbendazim (1.5, 3, and 4.5 mg/kg body weight) were administered intraperitoneally, and the skin was exposed to varied concentrations of the drug (15, 25, and 35 ppm) in lab aquariums. Giemsa solution (pH 7.0) at concentrations of 15 to 20% was used to stain peripheral blood smears. Blood smear slides were prepared after 24, 48 and 72 hours of exposure. The chemical produced several nuclear and cytoplasmic abnormalities in addition to micronuclei. The biological specimens of *Channa punctatus* were shown to be significantly impacted by high amounts of carbendazim. The study highlights the potential detrimental effects of improper use of carbendazim containing pesticides in agriculture on *Channa punctatus* and emphasizes the need for careful management of such chemicals to protect aquatic ecosystems. Further research employing different test systems necessary to reconcile the contradictory results observed in various test systems.

***Keywords*:** Channa punctatus, carbendazim, micro nucleus assay, genotoxic potential.

LAYERED Zn DOPED WO_3 NANOPLATES FABRICATED VIA HYDROTHERMAL METHOD FOR EFFICIENT PHOTOCATALYTIC DEGRADATION OF CONGO RED

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Abstract:

Orthorhombic Zn doped WO_3 nanoplates (1wt%, 2wt% and 5wt%) were fabricated by a simple and economical hydrothermal method. The photocatalytic activity of Zn doped WO_3 nanoplates was examined by degradation of Congo Red under visible light radiation. The effects of various experimental parameters like the concentration of dye, catalyst dose, and pH on the photocatalytic degradation were explored under identical conditions. The kinetics study shows that the photocatalytic reaction follows first order kinetics. The photocatalytic degradation was found to increase results show that with increased Zn-doped WO_3 nanoplates. If the effect of Zn doping compared, then photocatalytic degradation efficiency for 5 wt % Zn doped WO_3 was highest. Accordingly, introduction of Zn in the lattice of WO_3 was noticed to be distinctive enough to enhance their photo-degradation efficiency under visible-light. Further, Zn doping not only restricts the recombination of photo induced electron–hole pairs but also enhances the photostability of WO_3.

SYNTHESIS OF MALEIMIDE DYES FOR LARGE STOKES SHIFTED SOLVATOCHROMISM AND AGGREGATION-INDUCED EMISSION

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Abstract:

Tuning of photophysical characteristics of small molecule fluorophores by simple synthetic method is desired but possesses its own challenges. We are reporting

here an easy-to-achieve synthetic strategy to tune N-H maleimide-based fluorescent small molecules **2a-c** to achieve large Stokes shifted solvatochromism and aggregation induced emission (AIE) *via.* π-surface extension. Fluorophore **2a-c** exhibit broad solvatochromic emission range from blue to yellow (458 to 568 nm) due to intramolecular charge transfer with incremental large Stokes shift (110 nm to 192 nm) in nonpolar to polar solvent. The introduction of the phenyl ring affects both the electronic conjugation and the facile aggregation in the bad solvent. Along with synthesis, thermal stability and detailed photophysical study of the synthesized fluorophores and study of AIE in the THF/water mixture of a representative probe (**2c**) is presented. Moreover, experimental results are well supported by DFT study.

SYNTHESIS, SOLVATOCHROMIC, PHOTOPHYSICAL AND DFT STUDIES OF NEWER N-METHYLIMIDAZOLIUM BROMIDE

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Abstract:

Newer imidazolium bromide compound was prepared by reacting 1-methyl imidazole and 2-bromo-1-(naphthalen-2-yl)ethanone under microwave irradiation. The structure of the imidazolium compound was confirmed by spectral analysis, further photophysical, solvatochromic, and thermal properties were investigated. The Lippert-Mataga plot and solvent polarity empirical parameter $E_T(30)$ were used to examine solvent dependent optical properties of imidazolium compounds with a range of solvents with varying polarities. The thermal stability and phase behavior were studied by TGA and DSC analysis with a heating rate of 10 deg min^{-1}. DFT computation was performed to get the optimized molecular orbitals and HOMO-LUMO energies.

***Keywords*:** Lippert–Mataga plot, Microwave assisted synthesis, Photophysical, Solvatochromism, TD-DFT.

NATURAL RUBBER NANOCOMPOSITES INCORPORATED CELLULOSE

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Abstract:

The exceptional resilience, elasticity, abrasion resistance, and impact resistance of natural rubber make it a material with substantial economic significance. However, natural rubber has been shown to have several shortcomings, like low strength and modulus, which makes it possible to incorporate a reinforcing agent. Conventional rubber sectors mainly rely on petroleum-derived products like carbon black (CB). The current study intends to consume an easily accessible agricultural waste while also partially replacing CB in order to mitigate the environmental challenges. The mechanical characteristics, cross-linking densities, and vulcanization kinetics of rubber composites are significantly influenced by the surface chemical groups of nanocellulose, which is one of the most promising reinforcing fillers in the rubber business. With numerous good qualities like renewability, biocompatibility, non-toxicity, reactive surface, low density, high specific surface area, high tensile and

elastic modulus, and low specific surface area, nanocellulose is a potential filler. Even though nanocellulose has a high modulus and plentiful supply, selecting a reliable source and creating high-performing composites for industrial rubber are still very difficult tasks. After a comparative analysis of the effects of various forms of cellulose like cellulose Nanocrystals (CNCs) and cellulose nanofribrils (CNFs) on natural rubber composites, it was discovered that adding nanocellulose sped up the vulcanization process and enhanced the mechanical qualities of NR composites.

***Keywords*:** Natural Rubber, Nanocomposites, reinforcing fillers, cellulose.

SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL EVALUATION OF 4-(4-BROMO-1-HYDROXYNAPHTHALEN-2-YL)-6-(3,4-DIMETHOXYPHENYL)-5,6-DIHYDROPYRIMIDINE-2(1H)-ONE

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Abstract:

1-(4-Bromo-1-hydroxynaphthalen-2-yl)-ethan-1-one was prepared by refluxing 4- bromonaphthalen-1-ol with glacial acetic acid in presence of fused $ZnCl_2$. By condensing 1-(4-bromo-1-hydroxynaphthalen-2-yl)-ethan-1-ones with 3,4-dihydroxy benzaldehyde, to prepared by 1-(4-bromo -1- hydroxynaphthalen-2-yl)-3-(3,4-dihydroxyphenyl)-prop-2-en-1-one was synthesized 4-(4-Bromo-1-Hydroxynaphthalen-2-Yl)-6-(3,4-Dimethoxyphenyl)-5,6-Dihydropyrimidine-2(1h). One, urea and concentrated HCl in DMF were added and refluxed. Cool and pour in crushed ice. Treat it with cold NH_4OH solution to obtain titled compounds. The compounds thus synthesized have been characterized by physical and spectral data. All of these titled synthesized compounds have been screened for antimicrobial study and are found to possess excellent antimicrobial activities.

Keywords: Antimicrobial Activities, Cold NH_4OH Solution, Conc. HCl in DMF.

AI AND BIG DATA FOR DETECTING SUSPICIOUS FINANCIAL TRANSACTIONS

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Abstract:

The rapid growth of digital financial services has increased the risk of fraudulent activities such as money laundering, insider trading, and illicit fund transfers. Traditional rule-based fraud detection systems often fail to keep up with evolving financial crime patterns. This paper explores the integration of Artificial Intelligence (AI) and Big Data Analytics to enhance the detection of suspicious financial transactions. AI-powered models, particularly machine learning and deep learning**,** can analyze vast amounts of structured and unstructured financial data in real time to identify anomalies and hidden patterns indicative of fraudulent activities. Additionally, Big Data technologies enable efficient processing and storage of high-volume transactional data, improving fraud detection accuracy. We discuss various AI techniques such as anomaly detection, natural language processing (NLP) for transaction monitoring, and graph analytics for money trail mapping. Furthermore, the study highlights the role of federated learning in privacy-preserving financial crime detection across institutions. By leveraging AI and Big Data, financial organizations

can develop proactive, adaptive, and scalable fraud detection frameworks to combat financial crimes while ensuring regulatory compliance.

SYNTHESIS, SPECTRAL CHARACTERIZATION AND ANTIBACTERIAL SCREENING OF THIOPHENE BASED PYRIMIDINE DERIVATIVES

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Abstract:

A series of thiophene based pyrimidine derivatives were designed and prepared by reacting chalcones with urea in presence of base in ethanol. The corresponding chalcones were synthesized from 2-acetyl-5-bromothiophene on condensation with different aldehydes in alcoholic KOH. The structures of newly synthesized pyrimidine derivatives were established on the basis of NMR, IR and Mass spectroscopic data. All newly synthesized compounds were evaluated for their antibacterial activity against four organisms: *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Klebsiella pneumoniae* using streptomycin as a standard drug and found significantly active.

Keywords- Chalcones, Pyrimidines, Antimicrobial Activity.

ENGINEERING A SYNERGISTIC INTERFACE: $ZnIn_2S_4$-DECORATED Cu-MOF FOR EFFICIENT RECALCITRANT DYE REMOVAL

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Abstract:

Recalcitrant dyes pose a significant threat to water resources, necessitating the development of efficient and sustainable remediation strategies. This study reports the synthesis of a novel hybrid photocatalyst, $ZnIn_2S_4$@Cu-BTC MOF, fabricated via an in-situ growth method with varying $ZnIn_2S_4$ concentrations (10%, 20%, and 30%, designated as CUM-Z1, CUM-Z2, and CUM-Z3, respectively) for enhanced dye removal under visible-light irradiation. The heterostructure integrates the visible-light responsiveness of $ZnIn_2S_4$ with the high surface area and tunable porosity of Cu-BTC MOF, promoting effective dye adsorption and subsequent photocatalytic degradation. Characterization techniques, including UV-Vis spectroscopy, FTIR, XRD, SEM, TEM, and BET surface area analysis, confirmed the successful incorporation of $ZnIn_2S_4$ within the Cu-BTC MOF framework, enhancing light harvesting and charge separation. The photocatalytic performance was assessed using Methylene Blue (MB) dye, where batch experiments were conducted to evaluate the effects of pH, catalyst dose, initial dye concentration, and reaction time. Among the synthesized composites, CUM-Z2 exhibited superior photocatalytic efficiency, achieving nearly 100% MB degradation within 35–40 minutes. A possible degradation mechanism was proposed based on radical scavenging experiments, and post-degradation products were analyzed using LC-MS.

***Keywords*:** Photo-Degradation, Recalcitrant, Metal Organic Framework.

SYNTHESIS, PHYSICOCHEMICAL CHARACTERIZATION, MAGNETIC, AND THERMAL KINETIC STUDIES OF NEW CHELATE POLYMERS DERIVED FROM ADIPOYL BIS-ISONIAZID

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Abstract:

A new adipoyl bis-isoniazid (ADBI) ligand has been synthesized. The characterization of the ADBI ligand has been carried out by Mass spectrometry, FTIR and ^{1}H-NMR spectroscopic techniques. The spectral data suggest that the synthesized ADBI ligand possesses potential coordination sites and can act as a chelating ligand. A series of new transition metal chelate polymers of Mn (II), Fe (II), Co (II), Ni (II), Copper (II) and Zn (II) with ADBI ligand were synthesized and characterized by elemental analysis, FTIR, XRD, SEM, EDX. The geometry of the chelate polymers were assigned by magnetic susceptibility measurements and electronic spectral studies. The comparative thermal stability and kinetic parameters of the synthesized chelate polymers were investigated using thermogravimetric analysis (TGA/DTA) techniques. Moreover, the kinetic parameters were evaluated based on the thermograms. The kinetic triplet such as activation energy (*Ea*), order of reaction (n) and Arrhenius factor (A) were evaluated by using Coats-Redfern method.

***Keywords*:** Isoniazid, Chelate polymer, thermogravimetric analysis, Kinetic studies.

A REVIEW ON ENHANCED PHOTOCATALYTIC WASTEWATER TREATMENT USING PHYTOFABRICATED COPPER NANOPARTICLES

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Abstract:

The growing concern over water pollution has urged into the development of efficient and sustainable wastewater treatment techniques. Among various approaches, photocatalysis using nanomaterials has emerged as a promising solution for waste water treatment due to its high degradation efficiency and environmental friendliness. Among these Phytofabricated copper nanoparticles (CuNPs) have emerged as efficient photocatalysts for wastewater treatment due to their eco-friendly synthesis, cost-effectiveness, and high degradation efficiency. This review article explores the green synthesis of CuNPs using plant extracts, their structural characterization, and their photocatalytic applications in degrading organic pollutants, reducing heavy metals, and inactivating microbes. Key factors affecting their performance, including particle size, pH, light intensity, and composite formation, are discussed. Despite of challenges like stability and large-scale implementation, advancements in nanotechnology highlights CuNPs as a promising solution for sustainable wastewater remediation.

REACTION OPTIMIZATION STUDY OF THIOBARBITURIC ACIDS USING UV-VISIBLE SPECTROPHOTOMETER

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Abstract:

The rates of formation of products have studied by absorption technique depending on the type of molar proportion of reactants along with other reaction conditions. The reaction with molar proportion between symmetric and unsymmetrically substituted thiourea and malonic acid in presence of acetyl chloride and 1,3-disubstituted-thiobarbituric acids and aldehydes in presence of organic acid. These reactions are monitored by UV-Visible spectrophotometer. Reactants converted into products with acid catalyst in a different range, first we observed that, the reaction optimization at room temperature stirring subsequently on heating at different temperature have studied. When different molar proportion of reactants reacts during the reaction, then different colouration with slight changes in absorbance corresponding to particular wavelengths obtained. The absorbance with corresponding to wavelength in UV-Visible spectrophotometer measured by optimizing the reaction for every molar concentration reaction with varied time interval at room temperature.
***Keywords*:** Barbituric acid, thiobarbituric acid, Knovenagel derivatives.

OXIDATION OF A-HYDROXY ACIDS (MANDELIC, GLYCOLIC, CITRIC, MALIC AND TARTARIC) WITH WATER SOLUBLE NANO PARTICLES OF COLLOIDAL MnO_2 IN THE ABSENCE AND PRESENCE OF CATIONIC, ANIONIC AND NON-IONIC SURFACTANT (TX-100)

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Abstract:

The oxidation of α-hydroxy acids (mandelic, glycolic, citric, malic, and tartaric) by water-soluble colloidal MnO_2 nanoparticles was studied in both aqueous and micellar media, specifically in the presence of the non-ionic surfactant TX-100. The reaction has two paths autocatalytic and non-autocatalytic. Both in absence and presence of non-ionic surfactant i.e. TX-100, first-order rate with respect to colloidal MnO_2 and α-hydroxy acids is observed. Non-ionic surfactant (TX-100) catalyses the reaction due to multiple hydrogen bond whereas cationic CTAB (Cetyl trimethyl Ammonium Bromide and SDS (Sodium dodecyl Sulphate) show no any effect.
Keywords: Nano Colloidal MnO_2. Oxidation. Reduction. α-hydroxy acids. TX-100

GREEN SYNTHESIS OF GOLD NANOPARTICLES USING *CATUNAREGAM SPINOSA* EXTRACT FOR EFFICIENT CATALYTIC REDUCTION OF 4-NITROPHENOL, PHOTOCATALYTIC DYE DEGRADATION, AND ANTIMICROBIAL ACTIVITY

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Abstract:

The primary objective was to evaluate the potential of these AuNPs for wastewater treatment and biomedical, including 4-nitrophenol reduction and dye

degradation, as well as their antibacterial activity. This study introduces a novel green synthesis of gold nanoparticles (AuNPs) using *Catunaregam spinosa* plant extract for the first time. This eco-friendly method offers a sustainable alternative to conventional synthesis techniques. The plant extract functioned as a bio-reductant and stabilizing agent, facilitating a simple and rapid synthesis process. The synthesized CNS-AuNPs were characterized using various analytical techniques, including FTIR, UV-Vis, FESEM, EDX, AFM, and TEM. HR-TEM analysis determined the average particle size to be approximately 21.39 nm. The catalytic activity of CNS-AuNPs was demonstrated through the reduction of 4-nitrophenol to 4-aminophenol using $NaBH_4$, achieving a high conversion efficiency of 96% with a kinetic rate constant of 0.0107 min^{-1}. Additionally, the photocatalytic degradation of amido black 10B under visible light resulted in 87.48% dye degradation within 120 minutes, following a pseudo-first-order kinetic rate constant of 0.0029 min^{-1}. Furthermore, the green-synthesized CNS-AuNPs exhibited significant antibacterial activity against *Staphylococcus aureus*, *Streptococcus mutans*, and *Klebsiella pneumoniae*, as evaluated using the agar well diffusion method. The robust antibacterial and catalytic properties of CNS-AuNPs highlight their potential for applications in wastewater treatment, organic pollutant degradation, and biomedical applications.

***Keywords*:** Green synthesis, *Catunaregam spinosa*, 4-Nitrophenol, Photocatalytic activity, antimicrobial activity.

FEDERATED LEARNING: ALGORITHMS AND OPTIMIZATION TECHNIQUES

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Abstract:

Federated Learning (FL) is an emerging decentralized Machine Learning approach that enables multiple clients to collaboratively train a model without sharing their raw data. This paper explores the key algorithms and optimization techniques used in FL, with a focus on Federated Averaging (FedAvg), Federated Stochastic Gradient Descent (FedSGD), and advanced optimization methods aimed at improving efficiency, security, and robustness. The challenges of non-IID data, communication overhead, and computational constraints are discussed, along with recent advancements in adaptive federated learning.

EFFICIENT DYE ADSORPTION WITH $CAIN_2S_4$@GO: A SUSTAINABLE APPROACH

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Abstract:

The persistent challenge of dye pollution in aquatic environments necessitates the development of efficient and cost-effective adsorption technologies. This study

reports the synthesis and characterization of a novel Nano composite, $CaIn_2S_4$@GO (Graphene Oxide), fabricated via a solvothermal method for enhanced dye adsorption from aqueous solutions. The integration of $CaIn_2S_4$ semiconductor nanoparticles onto the GO sheets leverages the high surface area and excellent adsorption capacity of GO, coupled with the potential for $CaIn_2S_4$ to contribute to photo catalytic degradation under specific conditions. Detailed characterization using techniques like UV-Visible, XRD, FTIR, Raman spectroscopy and SEM confirms the successful deposition of $CaIn_2S_4$ onto the GO substrate, leading to a significantly increased surface area and altered surface chemistry compared to pristine GO and $CaIn_2S_4$. Adsorption studies using model dyes, such as Methylene Blue and Rhodamine B, demonstrate a substantially improved adsorption capacity and faster equilibrium kinetics for the $CaIn_2S_4$@GO Nano composite. The enhanced performance is attributed to the synergistic effect of increased surface area, improved dye affinity due to surface functionalities, and potentially, the initiation of photo catalytic activity. This novel $CaIn_2S_4$@GO Nano composite shows promising potential as an efficient and sustainable adsorbent material for dye removal, addressing the growing need for advanced water purification technologies.

***Keywords*:** Dye Adsorption, $CaIn_2S_4$@GO Nano composite, Photocatalyst

REMOVALOFNICKELFROMAQUEOUSSOLUTIONBYUSINGLIMONIA ACIDISSIMA (KAVATH) SHELLCARBON AND ACTIVATED CARBON AS AN ADSORBENT

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Abstract:

Activated carbon preparation from biomass resources, including various fruit peels, trees, leaves, plant roots, and grasses, are a good example. In this paper, Limonia acidissima activated carbon biomass resources achieved by chemical activation with activating reagent $ZnCl_2$. Physico-chemical characteristics of prepared activated carbon such as Bulk density, Porosity determination, Moisture content determination, Ash Content, and water-soluble matter, have been carried out to assess the suitability of carbon as adsorbent. Spectroscopic Characterizations were studied to analyze the internal structure of carbon by Scanning Electron Microscopy, XRD which provides information about the arrangement of crystals and Fourier Transform Infrared Spectroscopy has been used to detect functional groups present in the sample.

Keywords Activated carbon, Scanning Electron Microscopy, Fourier Transform Infrared Spectroscopy, X-ray Diffraction.

CARBON QDS FOR EMERGING BIOMEDICAL APPLICATIONS

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Abstract:

Carbon quantum dots (CQDs) with well-defined structures exhibit remarkably interesting characteristics, including outstanding water solubility, remarkable luminescence, excellent biocompatibility, and diverse surface functionalities.

Advances in synthetic methods have improved the ability to control size, surface composition allowing for the customization of functionalities for various purposes. CQDs can be synthesized from readily available and eco-friendly sources, such as plants, animals, and industrial waste. Although CQDs have demonstrated significant potential across multiple domains, notable progress in biomedical highlights their capacity for high-resolution, non-toxic imaging and the sensitive detection of biomolecules. Their large surface area and ability to modify surface chemistry underscore the tremendous potential of CQDs in tackling contemporary technological challenges. The predominant trends in the forthcoming synthesis of CQDs are expected to transition from traditional carbon resources to renewable carbon sources, paving the way for a more sustainable future.

A significant challenge in utilizing CQDs for biomedical applications is their minuscule size, which can lead to skin absorption or inhalation, posing potential health risks. While there has been considerable advancement in optimizing CQDs for targeted medical uses, essential aspects of their structural transformations and possible interaction mechanisms with specific biomolecules remain largely unknown, necessitating further investigation to assess their in vitro and in vivo behaviors. Future research avenues are suggested in order to get over the present restrictions and broaden the range of uses for CQDs.

Keywords: Carbon Quantum Dots (CQDs), Luminescence, Biomedical applications.

ENVIRONMENTALLY SUSTAINABLE SYNTHESIS AND MULTIFACETED BIOLOGICAL EVALUATION OF COUMARIN-1,2,3-TRIAZOLE DERIVATIVES

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Abstract:

An environmentally sustainable and highly efficient protocol was employed to synthesize coumarin-tethered 1,2,3-triazole derivatives *via* a copper(I)-catalyzed reaction between substituted aryl azides and terminal alkynes. The structures of the synthesized compounds 8a-g were thoroughly analyzed and confirmed by spectral characterization. Antibacterial evaluation revealed 8e as the most potent compound, exhibiting MIC values of 6.25 µg/mL and 12.5 µg/mL. The anti-inflammatory activity was assessed *via* protein denaturation inhibition, demonstrating that 8e had the lowest IC_{50} value of 28.75 ± 1.02 µg/mL, surpassing diclofenac sodium. The antioxidant study utilizing the DPPH assay indicated that 8c exhibited the strongest radical scavenging activity with an IC_{50} value of 18.92 ± 0.88 µg/mL. Structure-activity relationship studies were conducted for each biological activity. Molecular docking revealed a strong binding of the compounds to PGDS and DHPS. Compound 8e demonstrated the highest affinity for PGDS at -9.6 kcal/mol, while 8c strongly bound to DHPS at -9.8 kcal/mol. ADMET analysis confirmed favorable pharmacokinetics for all the compounds, with 8e and 8f exhibiting optimal bioavailability. The robust biological profile of compound 8e underscores its potential as a promising lead compound in pharmaceutical development.

***Keywords*:** Click chemistry, Coumarin, Triazole, Anti-bacterial, Molecular Docking.

CHARACTERIZATION OF NANOCOMPOSITE SYNTHESIZED FROM SPIRULINA AND GRAPHENE OXIDE

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Abstract:

In this research, graphene oxide was produced using a widely recognized modified Hummer's method. Graphite undergoes oxidation to become graphene oxide through the application of strong oxidizing agents that enhance the oxidation of the aromatic structures in the layers of graphite by employing a combination of H_2SO_4, $NaNO_3$, and $KMnO_4$. Spirulina is a type of edible multicellular microbe that is commonly utilized as a comprehensive nutritional source and possesses properties that may help in anticancer. The reaction of spirulina, different types of isothiocyanate and Graphene oxide to form new nanocomposite. In this reaction spirulina mixed with isothiocyanate using distilled water used as a solvent and heat it continues stirring on stirrer for 24hrs. the overall reaction was completed. After 24hrs. the above product mixed with Graphene oxide (0.25g) using distilled water used as a solvent and continues stirring on stirrer for 24hrs to form a new composite. After 24hrs we observed that the change of colour was faint green to black. According to infrared Spectra the (FTIR) analysis there is a change in peak of product and nanocomposite. As a result of X-ray Diffraction (XRD) the product and the nanocomposite show different values. The morphology of the nanocomposite was studied by Scanning electron microscope (SEM) showing Amorphous nature and also confirmed by Energy Dispersive Spectroscopy (EDS).

Keywords: Nanocomposite, Isothiocyanate, Graphene Oxide.

EXPLORING THE PHOTOLUMINESCENT PROPERTIES AND QUANTUM EFFICIENCY OF $CaMgSiO_6:Eu^{2+}$ AND $Na_3YSi_3O_9:Tb^{3+}$

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Abstract:

This study examines the photoluminescence (PL) quantum efficiency (QE) of two silicate-based phosphors—$CaMgSiO_6:Eu^{2+}$ and $Na_3YSi_3O_9:Tb^{3+}$—for solid-state lighting applications. Accurate determination of QE is crucial, as it indicates the proportion of absorbed photons converted via PL and directly influences the luminous efficacy of phosphor-converted LEDs. Each phosphor was synthesized by high-temperature solid-state reaction and characterized by X-ray diffraction (XRD) alongside detailed PL spectroscopy. The Eu^{2+}-doped $CaMgSiO_6$ phosphor displays broad-band photoluminescence attributed to 4f–5d transitions, while $Na_3YSi_3O_9:Tb^{3+}$ presents strong PL arising from $^5D_4 \rightarrow {}^7F_5$ transitions. Both materials exhibit minimal concentration quenching, correlating with high internal quantum efficiency. The precise quantification of QE in these silicate systems highlights their potential to enhance the performance of phosphor-based white LEDs, paving the way for more energy-efficient and color-accurate lighting solutions.

SPECTRAL ANALYSIS SYNTHESIS OF NOVEL 1,3,5- TRIAZINE DERIVATIVES- QUINAZOLIONE BASE CONJUGATE AND ITS SPECTRAL ANALYSIS BY NMR

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Abstract:

There are so many heterocyclic compounds but 1,3,5-triazine and its derivatives are very important heterocyclic compound. It has very wide range of application in various fields like agrochemical, medicinal, Pharma industry, Rubber industry, biochemical, etc. Its derivative can be used as drugs like anti-tuberculosis, anti-mycobacterial, antimicrobial, allergy inhibitor, antiprotozoal, antagonistic, anti-ulcerous, antidepressant, anti-malarial, antimicrobial, anticancerous, antifungal and biostatic agent, antiviral, anti-mycobacterial etc. These derivatives are also applicable in textile and plastic industry. Due to huge social application, the 1,3,5-triazine and its derivatives is very important topic of research. In this work we, prepared the novel 1,3,5-Triazine derivatives-Quinazolione base conjugate and analyse it by NMR spectral analysis.

Keywords: 1,3,5- Triazine, medicinal, anticancerous, spectral analysis, antimicrobial.

INDOOR AEROMYCOLOGICAL STUDIES IN TWO PRIMARY HEALTH CENTERS IN TWO DIFFERENT TAHSIL OF AMRAVATI DISTRICT MAHARASHTRA, INDIA

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Abstract:

There are many biotic and abiotic factors are present in an environment. Abiotic factors like temperature, humidity, light, dust particles, water drops, pollutants and biotic factors like algae, actinomyceties, fungi, bacteria etc. Aeromycology simply refers to the study of air born fungi. In the present research attempt were made to determine aeromycoflora of indoor environment of two Primary Health Center of Amravati District. The sample were collected in the month of January 2023 and February 2023. The main objective of this study was survey and identification of aeromycoflora and the concentration of fungi in that indoor environment of PHC . The petriplate exposure method were used for the isolation of fungal mycoflora. In the month of December Cladosporium cladosporioide (52.77 %) and Aspergillus niger (21.05 %) shows the highest percent contribution while Mucor hiemalis (2.77 %) ,M. sp.(5.26 %) , Fusarium sp.(2.77 %)(5.26 %) , Curvularia lunata (5.26 %) shows lowest percent contribution .In month of February Cladosporium cladosporioide (86.48 %) and (90.90 %) shows dominance in both the PHC and Aspergillus niger (2.70 %) (3.63 %) , Mucor hiemalis (2.70 %) and Alternaria alternate (3.63 %) . Some of these fungal species were reported as humans pathogens.

Keywords:- Aeromycology, Indoor.

AN INTRODUCTION TO SUMUDU-FOURIER TRANSFORM IN THE DISTRIBUTIONAL SENSE

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Abstract:
Fourier Transform play an important role in the field of mathematics, physics and engineering science also. There is the list of applications of Fourier transform. Fourier Transform is the key of signal processing and image processing. Sumudu transform is also a very efficient transform for solving differential and integral equations. There are various similarities in Fourier and Sumudu Transform. So, we tried to developed new integral Transform that is Sumudu-Fourier Transform in the distributional sense. This paper gives the generalization of Sumudu-Fourier Transform with the definition, its fundamental properties and applied it to solve some partial differential equations.
***Keywords*:** Sumudu Transform, Fourier Transform, Sumudu-Fourier Transform, Generalized function, Testing function space.

THIOCARBOHYDRAZONE METAL COMPLEXES OF COBALT, MANGANESE, AND IRON: SYNTHESIS, SPECTROSCOPIC CHARACTERIZATION, AND ANTIMICROBIAL ACTIVITY

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Abstract:
Thiocarbohydrazone metal complexes of cobalt, manganese, and iron have been synthesized and characterized using various spectroscopic techniques. The complexes were tested for their antimicrobial activity against various microorganisms. The results show that the complexes exhibit significant antimicrobial activity, making them potential candidates for therapeutic applications. We reported the synthesis, characterization, and biological evaluation of thiocarbohydrazone metal complexes of cobalt(III), manganese(III), and iron(III). The complexes were synthesized in good yields and were characterized by elemental analysis, IR spectroscopy, NMR spectroscopy, and mass spectrometry. The biological evaluation of the complexes showed that they exhibit significant antimicrobial and anticancer activities, making them potential candidates for therapeutic applications.
***Keywords*:** Thiocarbohydrazone, metal complexes, elemental analysis, IR spectroscopy, NMR spectroscopy, mass spectrometry and biological evaluation.

DESIGN AND SYNTHESIS OF BIOACTIVE TRIAZINE COUPLED PYRIMIDINE NANOPARTICLES

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Abstract:
Design and the synthesis of bioactive triazine coupled pyrimidine nanoparticles i.e. 6-(4-arylideneamino-6-methyl-[1,3,5]-triazin-2-yl-amino)-4-methyl-[1H]-pyrimidin-2-ones/thiones/amines have been worked out by the interaction of N-

(4-arylideneamino-6-methyl-[1,3,5]-triazin-2-yl)-3-oxo-butyramides with urea / thiourea / guanidine nitrate. Substituted 3-oxo-butyramides were prepared by the condensation of 2-amino-4-arylideneamino-6-methyl-[1,3,5]-triazines with ethylacetoacetate. Earlier, 2-amino-4-arylideneamino-6-methyl-[1,3,5]-triazines were prepared by reacting 2,4-diamino-6-methyl-[1,3,5]-triazine with different aldehydes. Synthesis of all the compounds was performed by both multistep conventional heating and microwave irradiation technique. Formation of compounds was confirmed by TLC. Nanoparticles of compounds 6-(4-arylideneamino-6-methyl-[1,3,5]-triazin-2-yl-amino)-4-methyl-[1H]-pyrimidin-2-ones/thiones/amines were prepared by using the ultrasonicator. Structural elucidation and characterization of synthesized compounds and their nanoparticles was done by chemical transformations, elemental analysis, equivalent weight determination, X-ray diffraction and spectral studies viz., 1H-NMR, IR, mass spectrometry.

Keywords: Design, synthesis, bioactive, triazine coupled pyrimidine, nanoparticles

A MINI REVIEW ON RECENT PROGRESS IN BIOLOGICAL ACTIVITIES OF 1,3,4-THIADIAZOLE AND ITS DERIVATIVES

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Abstract

The 1,3,4-thiadiazole scaffold has attracted much attention in medicinal and pharmaceutical chemistry because of its wide range of biological activities. This five-membered heterocyclic ring structure, which is distinguished by sulphur and nitrogen atoms, has remarkable pharmacological potential, including antibacterial, anticancer, anti-inflammatory, antioxidant, anticonvulsant, and antitubercular characteristics. 1,3,4-thiadiazole derivatives have a wide range of biological activity due to their ability to interact with enzymes and receptors via hydrogen bonding, π-π interactions, and coordination with metal ions. Furthermore, changes to the thiadiazole ring improve selectivity and effectiveness, making these compounds promising candidates for drug development and therapeutic applications. This research examines the fundamental biological activities of 1,3,4-thiadiazole derivatives, their structure-activity relationships, and their potential as lead molecules in therapeutic development.

***Keywords*:** 1,3,4-thiadiazole, antimicrobial, thiadiazole, scaffolds.

ADVANCES IN MEDICINAL CHEMISTRY: MULTIDISCIPLINARY APPROACHES TO DRUG DESIGN, SYNTHESIS, AND EVALUATION

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Abstract:

Novel therapeutic compounds that target a variety of illnesses, including as cancer, infectious illnesses, metabolic conditions, and drug-resistant infections, have been developed as a result of recent developments in medicinal chemistry. To improve therapeutic efficacy and safety, researchers have concentrated on investigating new bioactive chemicals, refining their molecular makeup, and

determining their mechanisms of action. The design and synthesis of nitrogen-based derivatives and heterocyclic molecules, as well as the use of ecologically friendly synthetic techniques, are important innovations. By combining synthetic chemistry, computational modeling, and biological evaluation, efforts to prevent antimicrobial resistance, create dual-action drugs for complicated diseases, and improve drug delivery systems highlight the field's multidisciplinary nature. This all-encompassing strategy has the potential to improve therapeutic results and solve important issues in contemporary drug research.

EVALUATION OF SOIL HEALTH AND FERTILITY FOR PADDY CULTIVATION IN CHAMORSHI TALUKA, GADCHIROLI DISTRICT-MAHARASHTRA

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Abstract:

Soil health and fertility are vital factors influencing the productivity of agricultural land, especially in paddy cultivation. This research assesses the soil health and fertility status of paddy-growing regions in Chamorshi Taluka, Gadchiroli District, Maharashtra. A detailed soil analysis was conducted to evaluate key physicochemical characteristics such as soil texture, pH, electrical conductivity, organic carbon content, macronutrients (nitrogen, phosphorus, potassium), and micronutrients (zinc, iron, copper, manganese). The results revealed variations in soil fertility across different locations, with some areas exhibiting deficiencies in essential nutrients. The soil pH ranged from slightly acidic to neutral, directly affecting nutrient availability for paddy crops. Organic carbon content was observed to be moderate, while nitrogen and phosphorus levels fluctuated, highlighting the necessity for balanced fertilizer application. This study underscores the need for location-specific soil management practices to improve fertility and sustain rice productivity. Strategies to enhance soil health include the use of organic amendments, proper fertilization methods, and conservation techniques to ensure long-term soil sustainability. The findings provide valuable guidance for farmers and agricultural policymakers in enhancing paddy cultivation efficiency in Chamorshi Taluka.

REVIEW ON RECENT DEVELOPMENT IN SYNTHESIS AND ANTICANCER ACTIVITY OF QUINOLINE DERIVATIVES

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Abstract:

Among heterocyclic compounds, compounds with Quinoline core gained much importance in medicinal chemistry. Quinoline, any of a class of organic compounds of the aromatic heterocyclic series characterized by a double-ring structure composed of a benzene and a pyridine ring fused at two adjacent carbon atoms. The benzene ring contains six carbon atoms, while the pyridine ring contains five carbon atoms and a nitrogen atom. The simplest member of the quinoline family is quinoline itself, a compound with molecular structure C_9H_7N. Quinoline is used principally for the manufacture of nicotinic acid, which prevents pellagra in humans, and other chemicals. Several methods are known for its preparation, and production

of synthetic quinoline exceeds that from coal tar. Quinoline hydrazone scaffold plays an important role in anti-tuberculosis and anticancer drug development as their derivatives have shown outstanding results. This broad spectrum of biological and biochemical activities has been further assisted by the synthetic flexibility of quinoline, which permits the invention of a large number of structurally varied hydrazone derivatives and their metal complexes. In order to pave the way for future advanced research, there is a need to collect and analyze the latest information available so far in this promising area. In this review, we have compiled and discussed the published reports specifically on anti-tuberculosis and anticancer potential of quinoline hydrazone derivatives. It is hoped that this review will be helpful for researchers in developing a new view in the search for rational designs of more active and less toxic quinoline-based anti-TB and anticancer drugs.

SUSTAINABLE NANOMATERIALS IN RASASASTRA: INSIGHTS FROM TRADITIONAL CHEMICAL PRACTICES

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Abstract:

Rasasastra, the ancient Indian science of metallurgy and material processing, has long employed nanoscale metal formulations, demonstrating principles that align with modern nanotechnology. This study explores the traditional synthesis of gold (Swarna Bhasma), silver (Rajata Bhasma), and mercury-based (Parada) preparations, emphasizing their nanoscale properties and eco-friendly processing techniques. Many of these historical practices involved biogenic reduction and controlled calcination, paralleling contemporary green nanotechnology. By analyzing these traditional methodologies, this work highlights their potential contributions to sustainable nanomaterial synthesis. Insights from Rasasastra can inspire greener approaches in modern material sciences, reducing environmental impact while enhancing technological applications in medicine, catalysis, and energy storage.

***Keywords*:** Rasasastra, Nanotechnology, Green Chemistry, Sustainable Materials, Gold Nanoparticles, Traditional Metallurgy.

OPTIMIZATION AND CHARACTERIZATION OF CZTS THIN FILM BY CHEMICAL BATH DEPOSITION FOR RENEWABLE ENERGY DEVICES

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Abstract:

Copper zinc tin sulfide (CZTS) thin films are promising materials for photovoltaic applications due to their optimal bandgap, high absorption coefficient, and non-toxic constituents. This study focuses on optimizing and characterizing CZTS thin films synthesized via chemical bath deposition (CBD), a cost-effective technique suitable for large-scale production. By fine-tuning deposition parameters to achieve a stoichiometric ratio of Cu:Zn:Sn:S as 2:1:1:4, we aim for uniform, high-quality films with minimal defects. Characterization techniques such as X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), and UV-Vis spectroscopy reveal crucial insights. XRD confirms

the kesterite phase formation with a preferential (112) orientation. SEM shows a porous, uniform nanoflake-like morphology, while EDX verifies the stoichiometric ratio. UV-Vis spectroscopy indicates a high absorption coefficient (>10^4 cm^-1) in the visible region and an optical bandgap of 1.4-1.6 eV. The optimized CZTS films, integrated into photovoltaic devices, exhibit a power conversion efficiency (PCE) of 15-18%. This research demonstrates the feasibility of CZTS thin films for cost-effective, large-scale renewable energy production, with future work aimed at improving film quality and device efficiency.

ANALYTICAL STRUCTURE OF TWO-DIMENSIONAL SIMPLIFIED FRACTIONAL FOURIER TRANSFORM

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Abstract:

The Analytical Structure of the Two-Dimensional Simplified Fractional Fourier Transform (2D-SFRFT) provides a mathematical framework for extending the classical Fourier transform to fractional orders in two dimensions. This transform serves as a generalization of the standard Fourier transform, offering flexibility in signal processing, optics, and image analysis. The 2D-SFRFT retains essential properties of linearity, separability, and reversibility while simplifying computational complexity compared to the full fractional Fourier transform (FRFT). This study explores the analytical derivation of the 2D-SFRFT, its kernel properties, and its relation to classical Fourier analysis. Furthermore, applications in image filtering, pattern recognition, and phase-space analysis are examined to highlight its utility. The findings emphasize the advantages of the 2D-SFRFT in efficiently representing and processing multi-dimensional signals in a fractional domain.

***Keywords*:** Fractional Fourier transform (FRFT), Simplified Fractional Fourier Transform (SFRFT) etc.

GRAPHENE AND POLY ALPHA METHYL STYRENE BASED CROSS-LINKED POLYMER FOR OILY WASTE WATER TREATMENT

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Abstract:

In this study crosslink polymer of Graphene (Gr) and Poly (α-methyl styrene) (PAMS) was prepared via in situ polymerization. The synthesized polymer was subjected to comprehensive analysis using various techniques i.e. scanning electron microscopy (SEM) and contact angle measurement. By contact angle measurement the synthesized polymer is found to be hydrophilic which may be used as membrane for oily waste water treatment. Because oily waste water may come from a number of sources and have an impact on people, animals, plants, and the environment, oily wastewater has been identified as the most dangerous type of environmental pollution. Traditional polymeric membranes can provide great rejection performance and water flow, but they are prone to fouling, which is brought on by oil molecules interacting

with the membrane surfaces. As a result, this membrane's wettability and antifouling qualities are crucial for managing this problem. Thus, this finding provides valuable insight to manage this issue.

Keywords: Polymer, Graphene, Poly (α-methyl styrene), treatment, membrane.

ADVANCEMENTS IN POLYMERIC FLEXIBLE MEMBRANES FOR WATER AND WASTEWATER TREATMENT

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Abstract:

Advanced polymeric membrane development is now in very high demand in water and wastewater treatment, particularly in the domain of filtration performance enhancement, resistance to fouling, and mechanical flexibility. This research article on polyvinyl alcohol (PVA) -based membranes is presented regarding their fabrication strategies, structural tuning, and use in the environment. Hydrophilic and biocompatibility traits of PVA enhance membrane affinity for water, while polysulfone provides chemical stability and mechanical strength. Immodulated membrane composition improved water permeability by 45–55% and achieved 70–75% increased rejection efficiency in terms of pollutants like heavy metals and organic toxins. Surface modifications involving crosslinking and phase inversion effectively govern pore size distribution, regulate swelling tendencies, and suppress biofouling to up to 62%. Characterization studies scanning electron microscopy (SEM) and other microstructural studies confirm the homogeneous incorporation of the polymer matrix, leading to enhanced durability and stability of performance have been performed. Practical uses of PVA-polysulfone membranes in wastewater recycling, industrial effluent treatment, and desalination are also discussed in the study, citing their scalability and sustainability for use in environmental remediation.

***Keywords*:** Polyvinyl alcohol (PVA), Polysulfone membrane, Flexible polymeric membranes, Fouling resistance, Swelling control, Pollutant rejection efficiency.

CRYSTAL GROWTH AND SOME STUDIES OF VINPOCETINE

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Abstract:

Single crystal of Vinpocetine was grown with slow evaporation technique using solvent Ethanol. The Chemical structure of $C_{22}H_{26}N_2O_2$, crystallizes into monoclinic system with, P2 1 space group withlattice parameters a = 8.8974(3), b = 9.5347(3)Å and c = 11.2853(3) Å, β=106.536˚(1). In the present paper, compare the theoretical and experimental studies on vinpocetine ($C_{22}H_{26}N_2O_2$) carried out by Gaussian 09 software and XRD.

***Keywords*:** Single Crystal, Vinpocetine, slow evaporation, Crystal Arrangement.

TIME HARMONIC INTERACTIONS IN A NONLOCAL THERMOELASTIC DIFFUSION SOLID DUE TO THERMAL SOURCE

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Abstract:

This study investigates the dynamic behavior of nonlocal thermoelastic solid with diffusion subjected to thermal force, with a focus on the influence of angular frequency on the material. To examine this, we consider nonlocal thermoelastic solid with diffusion. The governing equations are solved in the frequency domain to analyze the frequency-dependent response of the nonlocal thermoelastic solids with diffusion. Our findings is that angular frequency significantly effects the normal stress, shear stress, mass concentration and tenperature change. The study highlights the importance of angular frequency in determining the stress, temperature and concentration fields in nonlocal thermoelastic-diffusive solids under inclined loading. The results provide valuable insights for applications in advanced materials science, micro- and nano-scale engineering, and dynamic load analysis, where understanding the coupled effects of nonlocality, thermoelasticity, and diffusion is essential.
Keywords: Thermoelastic; thermomechanical; Fourier transformation; stress; nonlo.

NOVEL TRANSITION METAL ION COMPLEXES OF LIGAND 7-((5-ETHOXY-2-HYDROXYPHENYL) (DIPHENYLAMINO)METHYL) QUINOLIN-8-OL AND STUDY ON THEIR ANTIMICROBIAL SCREENING.

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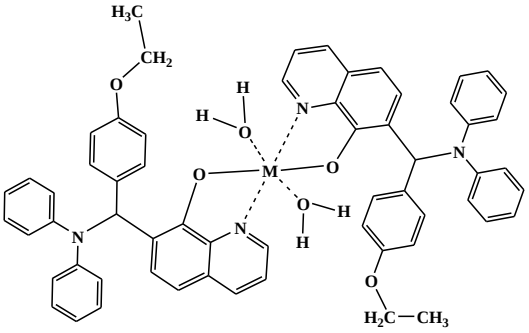
Abstract:

Complexes of Synthesis and characterization of Novel transition metal complexes of Mannich Base 7-((5-Ethoxy-2-Hydroxyphenyl) (Diphenylamino) Methyl)Quinolin-8-ol l with Mn(II), Co(II) Ni(II),Cu (II) and Zn (II), metal ions were synthesized from ethanol solutions. The complexes have been characterized by UV-Vis, FT-IR, ^{1}H NMR & X-Ray diffraction analytical Techniques. The antibacterial activity also screened against the gram +ve and gram –ve bacterial strains.



M = Mn++, Co++, Ni++, Cu++, Zn++

Bis (7-((5-Ethoxy-2-Hydroxyphenyl) (Diphenylamino)Methyl)Quinolin-8-ol) Metal (II)

Keywords: 7-((5-Ethoxy-2-Hydroxyphenyl) (Diphenylamino) Methyl) Quinolin-8-ol; Transition metal ion complexes; Antibacterial Activity.

EFFECT OF TEMPERATURE ON STRUCTURAL AND DIELECTRIC PROPERTIES OF ZINC FERRATE

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Abstract:

Ferroelectric zinc ferrate ($ZnFeO_3$) nanocrystalline powders were successfully synthesized by using a wet chemical reaction method and subjected to sintering at 550°C, 650°C, and 750°C for 5 hours. X-ray diffraction (XRD) analysis confirmed the formation of a single-phase $ZnFeO_3$ perovskite structure, with crystallite sizes of 35.25 nm, 30.60 nm, and 26.20 nm at respective sintering temperatures. As the sintering temperature increased, residual ZnO phases disappeared, resulting in pure $ZnFeO_3$ formation. This study discusses the influence of sintering temperature on the structural and dielectric properties of the synthesized $ZnFeO_3$.

Keywords: $ZnFeO_3$, Sintering Temperature, XRD, Dielectric properties.

SYNTHESIS OF MANNICH BASE 7-((5-BROMO-2-HYDROXYPHENYL) (DIPHENYLAMINO)METHYL)QUINOLIN-8-OL AND STUDY ON THEIR NOVEL COMPLEXES WITH TRANSITION METAL IONS, ANTIMICROBIAL SCREENING & MAGNETIC SUSCEPTIBILITY.

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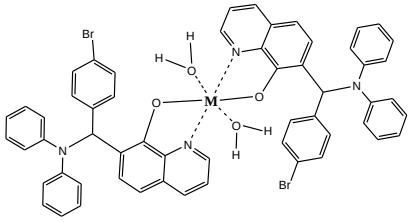
Abstract:

Complexes of Synthesis and characterization of Novel transition metal complexes of Mannich Base 7-((5-Bromo-2-Hydroxyphenyl) (Diphenylamino)Methyl)Quinolin-8-ol with Mn(II), Co(II) Ni(II),Cu (II) and Zn (II), metal ions were synthesized from ethanol solutions. The complexes have been characterized by UV-Vis, FT-IR, ^{1}H NMR & X-Ray deffraction analytical Techniques. The antibacterial activity also screened against the gram +ve and gram –ve bacterial strains. The magnetic susceptibility also studied for geometrical orientation of the metal complexes. The characterizations reviled that, the copper complex showed square planner geometry. However, other metal complexes showed tetrahedral geometry.



M = Mn++, Co++, Ni++, Cu++, Zn++

Bis (7-((5-Bromo-2-Hydroxyphenyl) (Diphenylamino)Methyl)Quinolin-8-ol) Metal (II)

Keywords: Mannich Base; Antibacterial Activity; Magnetic Succeptibility.

SYNTHESIS, CHARACTERIZATION AND MICROBIAL EVALUATION OF NANOPARTICLES OF SOME NEW N- SUBSTITUTEDTHIOBIURETS

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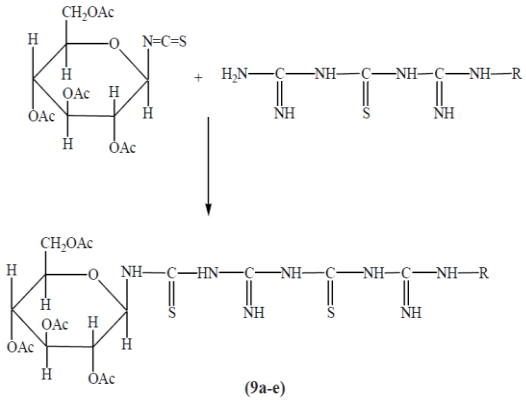
Abstract

The derivatives of Urea , thiourea & Thiosemicarbazide play an important role in medicinal Chemistry influencing various pharmacological activities. In view of application of this Thiobiurets and Nanoparticles, we hereby report the microbial evaluation of some new N-Substitutedthiobiurets. A Series of 1-[(N-TAG)thioamido]-5- substituted-formamidino-2-imino-4-thiobiuret have been synthesize successfully by refluxing TAGBr with cyanoamidinosubstituted thiocarbamides and 1-formamidino-3-substitutedformidinothiocarbamides in isopropanol for 3hrs. The justification of the structure of these newly synthesized compounds have been established on the basis of chemical characteristics, elemental analysis and IR, NMR and mass spectral analysis. These compounds were screened for their microbial activities including *Staphylococcus aureus*, *Escherichia coli*, *Psudomonas aeruginosa* and antifungal activities against *Aspergillus niger* & *Trichoderma*. TLC confirmed the activity of these compounds.



Where R = -H, -phenyl, -methyl, -ethyl and -allyl.

Keywords: Synthesis, characterization, Nanoparticles, Thiobiurets, Microbial Evaluation.

VISIBLE LIGHT PHOTODEGRADATION OF 4BS DYE USING Zn-DOPED TiO_2 NANOPARTICLES

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Abstract:

Zn-doped TiO_2 nanoparticles with different metallic concentrations (0.0, 0.2, 0.4, and 0.6 wt.%) were prepared using the sol-gel combustion method. A blank TiO_2 sample was also synthesized under identical conditions for comparison. The samples were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM),

and transmission electron microscopy (TEM). XRD analysis confirmed that the Zn-doped TiO_2 retained an anatase structure, with a decrease in particle size as the Zn content increased. SEM images indicated that the morphology of the TiO_2 samples was affected by the Zn doping. The main objective of this research was to improve the photocatalytic performance of the synthesized samples by degrading 4BS dye under visible light from a 15 W LED lamp. A 96.3% photodegradation rate was achieved with 1 gL-1 of Zn-doped TiO_2 at pH 6 over a period of 50 minutes.

Keywords: Zn-doped TiO_2: 4BS Dye: Photodegradation: Combustion method.

GREEN SYNTHESIS OF Nb_2O_5 NANOPARTICLES AND PHOTODEGRADATION OF REACTIVE RED 195A (RR195A) DYE

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Abstract:

The green synthesis of nanoparticles has gained significant attention due to its non-toxic and environmentally friendly nature. In this study, Nb_2O_5 nanoparticles were synthesized using a sustainable method from niobium ethoxide and Aloe Vera leaf pulp. The formation of Nb_2O_5 nanoparticles was confirmed through various characterization techniques, including X-ray diffraction (XRD), energy dispersive X-ray (EDX) analysis, Brunauer–Emmett–Teller (BET) surface area measurements, and Fourier-transform infrared (FTIR) spectroscopy. The photocatalytic performance of the synthesized Nb_2O_5 nanoparticles for the removal of Reactive Red 195A (RR195A) dye was investigated, focusing on parameters such as initial dye concentration, catalyst loading, and pH. The pH of the dye solution was varied between 1 and 12. For optimization, the highest decolorization rate of 95% was achieved within 120 minutes at a low initial dye concentration of 20 mg/L and 2.0 g/L of Nb_2O_5 as the photocatalyst. Additionally, the study also examined the effects of oxidant species and scavengers on the photocatalytic degradation process.

Keywords: Green synthesis; Nb_2O_5 Nanoparticles; Reactive Azo Dye; Photodegradation.

SYNTHESIS AND CHARACTERIZATION OF MOLECULARLY IMPRINTED POLYMERS FOR SELECTIVE SEPARATION OF KTI FROM DIFFERENT PRODUCTS

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Abstract:

Polymer particles imprinted for the protein Kunitz trypsin inhibitor (KTI) with 2- hydroxyethyl methacrylate (HEMA), N, N'- ethylene bis (acrylamide) (EbAM) and p-aminobenzamidine (p-ABA), as functional monomers, cross-linker and anchoring monomer respectively. The process was initiated by Tetramethylethylenediamine (TEMED) under UV polymerization with few optimizations. Imprint for the targeted template (KTI) created in the polymer will selectively remove the KTI molecules from the solution. Characterization of synthesized molecularly imprinted polymer

(MIP) was carried out by field emission scanning electron microscope (FESEM) for surface morphology, which reveals rough and cavities-based morphology. A spectroscopic investigation was carried out using Fourier transform infrared spectroscopy (FTIR) which confirms the polymerisation interaction. The confirmation of the rebinding efficacy of MIP is carried out using a rebinding experiment for synthesized molecularly imprinted polymer (MIP) and non-imprinted polymer (NIP) with protein molecule KTI. MIP possesses a variety of beneficial characteristics, such as selectivity and specificity, exceptional stability, compatibility with automation processes, reusability, rapid production, cost-effectiveness, and the ability to reuse immobilized templates. Moreover, it would be a very promising approach for real-time analysis and selective separation of any similar protein molecules from the mixture Keywords: Molecularly imprinted polymers; Functional monomer; Kunitz Trypsin Inhibitors; selective separation; rebinding assay; real-time analysis.

NUTRITIONAL ENHANCEMENT OF CROPS BY BIOFORTIFICATION

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Abstract:

Food crops contain a wide range of biologically active compounds that play a vital role in promoting overall human health. In industrialized countries, access to food crops rich in nutritional content is readily available. However, maintaining a diet that provides sufficient levels of vitamins and minerals can be challenging for large populations. Thankfully, recent advancements in agricultural biotechnology have made it possible to develop food crops that are nutritionally enriched, enhancing the content and bioavailability of essential nutrients like iron and vitamin A. The creation of plants that are both nutritionally enhanced and resistant to abiotic stresses offers a promising solution to future challenges. Crops can be biofortified in several ways, including adding the necessary minerals or inorganic compounds to fertilizers, through plant breeding, or by using biotechnology. Among these methods, the use of fertilizers enriched with micronutrients is the simplest approach to biofortification.
Keywords: Biofortification: Nutritional Enhancement: Biotechnology.

CERIA BASED ELECTROLYTE FOR LOW TEMPERATURE SOLID OXIDE FUEL CELLS (LT-SOFCS)

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Abstract:

In this study, Nd^{3+}-doped CeO_2 (NDC) and pure CeO_2 are synthesized using the EDTA-Glycol method, and their electrochemical properties are examined through various complementary techniques. The results indicate that both Sm3+ and Nd3+ are successfully incorporated into the CeO_2 lattice, maintaining the same cubic fluorite structure before and after doping. The introduction of Nd^{3+} leads to lattice distortion in CeO_2, which generates additional oxygen vacancies and enhances ionic conductivity. Fuel cells utilizing the nanocrystalline NDC and CeO_2 electrolytes

demonstrate remarkable electrochemical performance. At operating temperatures of 500 and 550 °C, the NDC fuel cell achieves peak power densities of 636.42, and 1072.33 mW·cm^{-2}, which are higher than those of the pure CeO_2 electrolyte, which show values of 571.54, and 782.72 mW·cm^{-2}. The superior performance of the NDC cell is attributed to its high ionic conductivity, suggesting that NDC could be a promising candidate for low-temperature solid oxide fuel cell (LT-SOFC) applications.
***Keywords*:** LT-SOFCs; Nd^{3+}-doped ceria electrolytes; electrochemical properties.

THE IMPACT OF CLOUD TECHNOLOGY IN HIGHER EDUCATION

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Abstract:

Cloud communication has democratized access to educational resources in India as some of the leading Edtech players are leveraging cloud-based solutions to deliver lectures, courses, and collaborative projects Cloud computing for education is fast becoming the norm the world over. The various ways cloud technology shapes the transformation of higher education. The benefits of a cloud transformation are plenty, from making higher education institutes competitive and helping them keep up with the times to equipping students with the practical skills they need later in the workforce. Various institutes are already leveraging this technology in their daily operations, leading to significant benefits in terms of reduced costs and increased efficiency overall. This has eliminated the need for expensive hardware and software.
***Keywords*:** Cloud Computing, Edtech

STUDIES ON PHOTOCATALYTIC EFFICACY OF TiO_2-EMBEDDED ZnO NANOCOMPOSITE

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[b]School of Nanoscience and Biotechnology, Shivaji University, Kolhapur, M.S. India.
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Abstract:

This study focuses on the synthesis and characterization of TiO_2-embedded ZnO nanocomposites with varying Titania (TiO2) contents (1 wt. %, 3 wt.%, and 5 wt.%) to evaluate their photocatalytic activities. The nanocomposites were synthesized using a sol-gel method, and characterized by XRD, SEM, FTIR, and UV-Vis spectroscopy. The photocatalytic degradation of rhodamine 6G (R6G) dye was tested under UV light. Among the synthesized samples, ZnO-5 wt. % TiO2 nanocomposite exhibited the enhanced photocatalytic efficiency, achieving 93.32% degradation of R6G, with a reaction rate constant of 8.97 $\times 10^{-3}$ min. These TiO_2-embedded ZnO nanocomposites offer functionality, enhancing the photocatalytic activities. Future research will focus on their scalability and visible-light photocatalytic performance to enhance their applications in environmental remediation and biomedical applications.
***Keywords*:** TiO_2-embedded ZnO, Nanocomposite, Photocatalyst, Rhodamine 6G.

TOXIC EFFECTS OF PARTHENIUM HYSTEROPHORUS ON HISTOLOGY OF GILLS OF FRESHWATER FISH LABEO ROHITA

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[2]Shri Shivaji Arts, Commerce and Science College, Akot (M.S.)
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Abstract:

A toxicity study was carried out on the freshwater fish *Labeo rohita* to assess the histological impact of *Parthenium hysterophorus* on the gills over a duration of 96 hours, with observations at 24, 48, 72, and 96 hours. The results revealed toxic effects on the gills.

Keywords: Parthenium hysterophorus, Gills Histology, Labeo rohita.

SYNTHESIS OF Fe_2O_3 NANOPARTICLES BY NEW SOL-GEL METHOD AND THEIR STRUCTURAL AND MAGNETIC CHARACTERIZATIONS

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Abstract:

α-Fe_2O_3 nanoparticles with sizes ranging from 25 to 50 nm were synthesized through a modified sol-gel method. Both pure alpha phase particles and those with a mixture of alpha and gamma phases were produced and identified using X-ray diffraction technique, Scanning electron microscopy, Transmission electron microscopy and BET analysis. Various parameters affecting particle size and phase composition were determined. The average particle size decreases as the calcination temperature of the gel increases and also decreases with higher citric acid concentrations. The calcination temperature influences the relative proportions of the two phases, thereby affecting the magnetization of the particles. As the calcination temperature increases, porosity of the α-Fe_2O_3 nanoparticles show a consistent increase with the gradual decrease in particle size highlighting the role of calcination temperature.

Keywords: Nanoparticles, α-Fe_2O_3 nanoparticles, sol-gel, SEM, X-ray.

STUDY OF VARIATION IN VISCOMETRIC AND ULTRASONIC BEHAVIOUR OF DERIVATIVES OF BISTHIOUREA AT VARYING TEMPERATURE

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Abstract:

The present study is deals with the study of intermolecular interactions in terms of relative viscosity, specific viscosity, ultrasonic velocity and related parameters such as adiabatic compressibility, apparent molar compressibility, Intermolecular free length, Relative association, Specific acoustic impedance and

apparent molar volume of substituted bisthiourea in different percentage and temperature of dioxane-water mixture. It has been prepared by change in the volume of solvent and keeping the volume of ligand fixed. The data obtained has been used to compute relative viscosity and thermodynamic parameters for viscous flow. The viscosities and ultrasonic parameters of 0.01M solutions of ligands 1-phenyl Bisthiourea, p-tolyl Bisthiouea, p-chloro phenyl Bisthiourea have been found out in 75%, 80%, 85% and 90% 1,4-dioxane-water mixture at different temperature (298K, 300K, 302K and 304K).

***Keywords*:** Bisthiourea, Relative viscosity, Specific viscosity, Ultrasonic velocity.

PHOTOCHROMISM FLUORESCENCE IN A KEGGIN TYPE POLYOXOMETALATES AND ANTHRANILIC ACID IN DIFFERENT MEDIA

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Khare Dhere Bhosale College, Guhagar Tal. Guhagar Dist. Ratnagiri 415703.
Affiliated to University of Mumbai.
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Abstract:

The photophysical properties of a Keggin-type polyoxometalates (POM) bounded to Anthranilic acid have been investigated. An organic-inorganic hybrid species of a Keggin type polyoxometalates $K_5[Co^{III}W_{12}O_{40}]$ has been synthesized and characterised by various spectroscopic techniques X-ray diffraction analysis, IR analysis, NMR spectra. The florescent aromatic hydrocarbons like Anthranilic acid and cobalt polyoxometalates studies reveals that both closed and open forms are emissive with distinct spectral properties.

Keywords: Keggin-type polyoxometalates; NMR spectra; X-ray diffraction analysis.

VOLUMETRIC, ULTRASONIC AND VISCOMETRIC BEHAVIOR OF L-HISTIDINE IN AQUEOUS GLYCEROL SOLUTIONS AT DIFFERENT TEMPERATURES

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Abstract:

The ultrasonic velocity (μ), density *(ρ)*, and viscosity*(η)* have been measured for aqueous glycerol solutions (5% and 10% of glycerol, w/w in water) of l-histidine at various concentrations from 0.01 to 0.1m at different temperatures (293.15, 298.15, 303.15, 308.15, 313.15 and 318.15) K. From these experimental data, apparent molar volume (Φ_v), limiting apparent molar volume (Φ_v^0), and the slope S_v, apparent molar compressibility $(K_{s,\Phi})$, limiting apparent molar compressibility $(K^0_{s,\Phi})$, and the slope S_k , transfer volume $(V^0_{\Phi tr})$,Viscosity coefficients B and A, and hydration number (n_h) have been calculated using standard relations. These parameters have been further used to interpret the type of molecular interactions such as van der Waals forces, dipole-dipole interactions, hydrogen bonding, solute-solvent, solute-solute interactions, etc. present in the system investigated.

Keywords: Ultrasonic velocity, apparent molar volume, apparent molar.

MOLECULAR DOCKING STUDY OF 1,4 -NAPHTHOQUINONE AGAINST (6BFN) FOR THE TREATMENT OF ANTI-INFLAMMATORY ACTIVITY

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Electronic Zone Building, MIDC, Hingna Road, Nagpur, Maharashtra, India -440016

Abstract:

Inflammation is an important pathological process in many chronic diseases and, therefore a prime target for therapeutic treatment. 1,4- Naphthoquinone is a naturally occurring compound that possesses various biological activities, such as anti-microbial, anti-cancer and anti-oxidant activity.. its ability to act as an anti-inflammatory agent has not been widely examined. This research examines the anti-inflammatory activity of 1,4-Napthoquinone through the use of molecular docking methods. The docking simulation were performed to assess the interaction of 1,4-napthoquinone with the major inflammatory targets such as cyclooxygenase-2 (cox2), Nuclear factor KAPPA-P (NF-KB), and tumor necrosis factor-alfa (TNF-alfa). This target plays role regulating pro-inflammatory enzyme and cytokines and thus key figure in inflammatory disorder. Molecular docking experiment were conducted through Pyrex to investigate the binding affinity and interaction pattern of 1.4-napthoquinone with active site of target protein. The outcome established that 1,4-naphthoquinone bind well with cox-2, NF-KB, and TNF-ALFA display in intensive binding affinities and positive molecular interaction such as hydrogen bonding and hydrophobic interaction. The observation conforms that 1,4-napthoquinone can be potentional inhibitor of major inflammatory pathway. In conclusion, this work offers the theoretical basis for the anti-inflammatory effect of 1,4-napthoquinone, which can be further conform by in-vitro and in-vivo experiment.

Keywords: molecular docking, Pyrex, computer-aided drug design, protein data bank.

HUMAN N-MYRISTOYLTRANSFERASE (HS-NMT) INHIBITORY ACTIVITY OF NITROGEN HETEROCYCLES: QSAR-BASED ANALYSIS

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Abstract:

N-myristoyltransferase (NMT) is an important eukaryotic monomeric enzyme which has emerged as an attractive target for developing a drug for cancer, leishmaniasis, ischemia-reperfusion injury, malaria, inflammation, a few to mention. The present work is an attempt to derive statistically robust machine leaning models (QSAR approach) for NMT inhibitory using a dataset of 309 Nitrogen heterocycles. The derived models not only fulfil the recommended values for a good number of validation parameters (e.g. R^2 = 0.77-0.79, Q^2_{LMO} = 0.75-0.76, CCC_{ex} = 0.86-0.87, Q^2-F^3 = 0.74-0.76, etc.) but also provide useful insights into the structural features that sway the Human N-Myristoyltransferase (Hs-NMT) inhibitory activity of Nitrogen heterocycles. That is, they have an acceptable equipoise of descriptive and predictive qualities as per OECD guidelines. The developed QSAR models identified a good number of molecular descriptors like solvent accessible surface area of all

atoms having specific partial charge, absolute surface area of Carbon atoms, etc. as important features to be considered in future optimizations.

Keywords: Human N-Myristoyltransferase; Nitrogen heterocycles; QSAR; Statistical Analysis

SYNTHESIS AND SPECTRAL CHARACTERIZATION OF SOME BROMO-SUBSTITUTED CHALCONES BY CONVENTIONAL METHOD

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Abstract:

The synthesis of bromo substituted chalcones were carried out by the reaction of 2-hydroxy-3-bromo-5-methyl acetophenone with different aromatic aldehydes. The newly synthesized chalcones were characterized by elemental analysis, IR and H1NMR spectral studies.

Keywords: chalcones, aromatic aldehyde, IR, H1 NMR.

GREEN SYNTHESIS OF NANOPARTICLES: A REVIEW OF METHODS AND MECHANISMS

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Abstract:

Nanoparticles are the tiny particles and they are important because they have special properties that make them very useful. These was significantly proven by many researchers by applying there in various experiments. The main property among them is that they posseting the large surface to volume ratio which make every particle of the material to take part in reaction. These can be synthesizing by two main ways: by breaking down big pieces of material into tiny ones called as top-down method (like grinding a big rock into powder) or by bottom-up method where the particles are built up from tiny atoms and molecules. The nanoparticles having the special role in medical industry by showing their specific activity. The most significant and known property of nanoparticle is the antimicrobial property. The metal has itself having the same but its efficacy increases when their form will change into nano one. Usually, making nanoparticles involves using strong chemicals and high temperatures, can be harmful to the environment. A better way to make nanoparticles is by using natural substances from plants, called phytochemicals. These substances can help turn metal ions into nanoparticles in a process that is safe for the environment. This method, known as green synthesis. The method includes plant extracts to create nanoparticles without harmful chemicals. The various biomolecule plays crucial role in synthesizing nanoparticles. It is found that proteins and amino acids, which are the building blocks of bodies, can help to make and stabilize nanoparticles. For synthesizing the nanoparticle, it is important to select proper method, if the method will not harm the environment, then the approach will contribute to the sustainability. Green synthesis method is a safer way to make

nanoparticles that helps and protect our planet while creating useful materials. This review article mainly focussing the green synthesis approach for synthesizing the nanomaterial.

Keywords: Biomolecules, Environment, Green Synthesis, Material, Nanoparticles.

A SURVEY ON SICKLE CELL ANEMIA IN CHANDUR RAILWAY TALUKA OF AMRAVATI DISTRICT, MAHARASHTRA

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Abstract:

Sickle cell anemia, a chronic life-threatening genetic disease caused by mutation in gene that makes the iron-rich compound hemoglobin, characterized by sickle shaped RBC's that lead to blockage of blood capillaries causing strokes, organ failure and even death in the affected persons. The present study aims to evaluate the status of Sickle Cell Minor and Sickle cell major patients, determine its prevalence and severity among carriers and sufferers in Chandur Railway taluka of Amravati District. It was reported that out of total Sickle cell anemia patients subjected to screening to collect data on the disease's status, Sickle cell Minor (heterozygotes-Carriers) are more as compared to Sickle cell major (homozygotes-Sufferers) patients. Also, it was observed that females are more affected than males. From the present study it is suggested that being an inherited disease if a person from a family is symptomatic for Sickle Cell Anemia can immediately consult a genetic counsellor and a physician, thus helping to understand the risk of having a child with this disease. Thus, a better understanding, management and awareness of the disease is required and also, an extensive medical research is required from recovery of Sickle Cell Anemia.

***Keywords*:** Sickle Cell Anemia, Sickle cell major, Sickle cell minor, Hemoglobin.

DIVERSITY AND IDENTIFICATION OF ENDOPHYTIC FUNGI ISOLATED FROM CLITORIA TERNATEA L. PLANT FROM AMRAVATI DISTRICT

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Abstract:

Endophytes refer to bacteria, fungi, actinomycetes and algae which spends their whole life cycle in the symplast or apoplast region of plants. Endophytic fungi are fungi that live within the internal tissues of plants without causing apparent harm to their host. They have been known to play crucial roles in enhancing plant growth, nutrient uptake, and resistance against pathogens. These fungi are known to produce biologically active compounds that can be used for medicinal purposes. Clitoria ternatea L. is a high-quality, protein-rich legume plant. Having a very significant medicinal value, used as a traditional Ayurvedic medicine for several human diseases from centuries like memory enhancer, nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing and sedative agent. 9 different fungal endophytes have been identified from the leaves and stem tissues in the current study, from the 3 different areas of Amravati District Maharashtra India. The Endophytic Fungi namely

Fusarium sp., Curvularia lunata, Diplodia sp., Cladosporium sp. 3 different sp. of Aspergillus, Penicillium sp. and Alternaria sp. are isolated. Aspergillus sp. and fusarium sp. is abundantly isolated from the stem and leaf of Clitoria ternatea L. plant. In these study Further evaluations of this research is in progress. The outcome of this study will demonstrate the potential of endophytic fungi from medicinal plants as a source of novel bioactive compounds for drug discovery. The findings of this research contribute the knowledge of plant-fungal interactions and offer potential insights for future biotechnological applications in various fields, such as sustainable plant growth, medicine, agriculture and ecological maintenance.

Keywords: Endophytic fungi, Clitoria ternatea L., Medicinal property's, Fusarium sp.

IMPACT OF URBAN DEVELOPMENT AND MODIFICATIONS ON SOME HIGHLY VALUED MEDICINAL PLANTS FROM AMRAVATI CITY M.S.

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Abstract:

Amravati is a divisional city of Maharashtra state having its own floral and faunal diversity. Beside that of the roadside avenue plantation there is vast floral diversity along with different fragmented habitats of city area. As Amravati is becoming a developing city, some constructive as well as developing steps to be undertaken by the city planning department of Municipal Corporation and governmental agencies as well. Along with the widening of main roads, the Municipal Corporation starts cementing of sides of the secondary as well as the colony roads since last five to ten years. For the constructive purpose there is lot of disturbances in natural habitat particularly for the road construction. But as we know, the roadside empty spaces are the only area in the urban environment which not only causes water infiltration but also involved in temperature regulation. On the other side these area provide the habitat for the survival of several herbaceous as well as shruby species. Such plant species not only important as a food chain requirements but also plays fulfill the medicinal desirability of local people. Since the onset of road side development the well adapted local species becomes rare and may remove from the urban environment like Amravati in the coming future. The present work tried to focus on the ongoing road development, community gardens and market sites in the Amravati city and the destruction of floral patches which was well established in the city environment since long time.

Keywords: floral diversity, urban environment, road development, habitat loss.

STUDY ON STRUCTURAL AND DIELECTRIC PROPERTIES OF La-Sr Co-DOPPED FERRITE WITH THE EFFECT OF TEMPERATURE

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Abstract:

Nanocrystalline powder of La-Sr co-doped ferrite ($LaSrFeO_3$) were successfully synthesized using a wet chemical reaction method and subsequently

sintered at 450°C, 550°C, and 650°C for 6 hours. X-ray diffraction (XRD) analysis confirmed the formation of a single-phase $LaSrFeO_3$ perovskite structure, with crystallite sizes of 30.20 nm, 25.80 nm, and 20.50 nm corresponding to the respective sintering temperatures. Increasing the sintering temperature led to the elimination of residual LaO phases, resulting in the formation of pure $SrFeO_3$. This study explores the impact of sintering temperature on the structural and dielectric properties of the synthesized $SrFeO_3$.

Keywords: $LaSrFeO_3$, Dielectric properties, Sintering Temperature, XRD.

THE IMPACT OF ENGLISH LANGUAGE ON SCIENCE AND TECHNOLOGY

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Abstract:

English Language holds the world of science and technology together. As it is a global language people can share their knowledge, collaborate on projects, and understand complex ideas. English language plays a crucial role in scientific research to the coding languages that enhances our technology. The most obvious advantage of English Language is that scientific results can be more widely accessed, and scientific exchange between countries is significantly enhanced. English language acts like a bridge, connecting people from different cultures and backgrounds. Science-based activities integrate reading, writing, listening, and speaking skill and the various experiments, group work, and other collaborative tasks need a global language which can connect or understand by the scientists all over the world. English Language can fulfill this need as it is globally speaking and understand by the most of the scientist and students. While looking through the history of inventions, it is known that many great scientific discoveries were made by people who spoke different languages. Isaac Newton spoke English; Marie Curie spoke Polish and French while Albert Einstein spoke German. These scientists shared their discoveries with the world through the English language.

Keywords**:** universal language of science, crucial role, bridge, wider scope.

ENGINEERING INNOVATIONS IN SCIENCE FOR SUSTAINABLE DEVELOPMENT: ADVANCING TECHNOLOGY FOR A GREENER FUTURE

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Abstract:

Innovation in science and engineering plays a pivotal role in achieving sustainable development by addressing global challenges such as climate change, resource depletion, and environmental degradation. This paper explores the engineering aspects of innovation in science, focusing on the development of green technologies, smart infrastructure, environmental engineering, biotechnology, and digital transformation. Key advancements such as renewable energy systems, smart transportation, waste-to-energy solutions, precision agriculture, and artificial intelligence-driven sustainability models are discussed. Additionally, the paper highlights the significance of circular economy principles, ethical considerations, and policy frameworks in guiding sustainable engineering practices. By integrating

scientific breakthroughs with engineering solutions, a sustainable future can be achieved through enhanced efficiency, resource optimization, and resilience against environmental challenges. This study underscores the necessity of interdisciplinary collaboration, policy alignment, and continuous innovation to ensure long-term sustainability in various sectors.

Keywords: Sustainable development, engineering innovation, green technology.

UNIFIED SECURE CLOUD STORAGE FOR MULTI ACCOUNT CREDENTIALS: A REVIEW PAPER

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Abstract:

In today's digital era, secure storage and access to multi-account credentials have become critical due to the proliferation of online accounts and the sensitive nature of personal information. The project titled "Unified Secure Cloud Storage for Multi-Account Credentials & quot; addresses this need by combining advanced face recognition technology, secure cloud storage, and a user-friendly mobile interface. This system ensures that user credentials for multiple accounts are stored and accessed securely, allowing users to access sensitive information only upon successful authentication through facial recognition. The application is built with Android Studio for the front-end interface, Django for the back-end server, and Amazon Web Services (AWS) for cloud storage, creating a highly responsive, secure, and scalable environment for credential management. The mobile application captures ten images of a user during the initial setup phase, which are then transmitted to the Django backend server and securely stored. The Deep Face library, leveraging the VGG-Face model, is employed to authenticate the user during each access request by comparing a live captured image with the stored images. If a minimum threshold of six out of ten matches is achieved, access is granted, ensuring robust security and reducing the chances of unauthorized access. This multi-layered approach includes several critical components: image processing and transmission, a sophisticated face recognition model, secure local and cloud storage, and rigorous data encryption protocols. AWS ensures the reliability and security of data storage, while DeepFace's VGG-Face model, a powerful convolutional neural network (CNN) pre-trained on facial features, provides an effective solution for facial verification. Additionally, the application features secure data handling practices, including encryption of local data storage on the Android app, which guards against potential data breaches. Through this paper, we aim to provide a reliable and secure solution for credential storage, balancing high-security standards with an intuitive user experience. The application's approach to multi-account credential management offers users a secure and efficient way to store and access sensitive information without the need for traditional passwords. The integration of deep learning for facial recognition not only strengthens user authentication but also represents a move toward more accessible and secure biometric solutions for everyday digital needs.

WOODLICE (ISOPODA: ONISCIDEA): AS A BIO-INDICATOR IN AGRICULTURE

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Abstract:

Now a day due to conversion of agriculture land into nonagricultural land for massive urbanization reduces available agricultural land. This reduces the leaf litter which is a habitat for woodlice. These mini creatures are important decomposers of leaf litter. Their diversity indicates good agriculture land. Terrestrial isopods

(Crustacea: Isopoda: Oniscidea) are an important component of biodiversity as they constitute useful bioindicators for monitoring environmental quality in a variety of natural and agricultural ecosystems. They are contributing to the decomposition of organic matter and regulating the microbial food web. They act as important elements of food chains, participating in the biological cycle of terrestrial ecosystems and soil-forming processes. Woodlice have a great ecological role in the decomposition process due to their digestive capabilities. They process scientifically decomposing agricultural, municipality, and industrial wastes into nutrient enriched compost. Use of woodlice increases growth and proliferation of microbes that amplify environment's betterment.

Keywords- Woodlice, Bioindicator, Agriculture.

FUNCTIONAL NANOMATERIALS: SYNTHESIS AND CATALYTIC APPLICATION IN BIOACTIVE HETEROCYCLE SYNTHESIS

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Abstract:

The integration of functional nanomaterials into catalytic processes represents a transformative advancement in bioactive heterocycle synthesis, crucial for pharmaceuticals, and advanced materials. This book chapter provides a thorough summary of current advancements in the synthesis and use of nanomaterials tailored for catalytic processes. We explore various methods for fabricating these nanomaterials, including both bottom-up and top-down techniques, and discuss their functionalization to enhance catalytic efficiency, selectivity, and stability. Emphasis is placed on the role of metallic, organic, biogenic, and bimetallic nanomaterials in improving reaction conditions for heterocycle formation. The book chapter highlights significant achievements, such as the development of catalysts that operate under mild conditions, which not only optimize reaction yields but also promote sustainability. Challenges related to scalability, environmental impact, and catalyst longevity are addressed, along with suggestions for future research directions. Overall, this review underscores the potential of functional nanomaterials to revolutionize heterocycle synthesis, offering new pathways for drug discovery and material innovation.

Keywords: Functional Nanomaterials, Catalytic Application. Bioactive Heterocycle

SPECTROSCOPIC AND ANTIMICROBIAL ANALYSIS OF $Sr_XMn_{1-X}Fe_2O_4$ (X= 0.2 & 0.4) NANOPARTICLES SYNTHESIZED BY SOL GEL CITRATE METHOD FOR WOUND HEALING THERAPY

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Abstract:

To explore the potential of spinel ferrite nanoparticles in wound healing therapy, a series of Sr-doped $MnFe_2O_4$ nanoparticles were synthesized by facile sol gel citrate method. The $MnFe_2O_4$ nanoparticles were doped with 0.2 and 0.4 % strontium (Sr) to evaluate and modify the optical, structural, elemental and antimicrobial properties. X-ray diffraction, Scanning Electron microscopy and EDS

were studied to validate the structure, morphology and elemental composition and confirm the alterations in lattice parameters due to doping of strontium (Sr). The presence of different chemical bond was confirmed using Fourier-transform infrared spectroscopy (FTIR) techniques. The optical band gap value was calculated by linear fitting of the curve and it was found that the band gap value increases from 3.58 eV to 4.67 eV after doping and this is due to lattice strain in the crystal and also the quantum confinement and it was investigated through UV-Visible spectrum. To study the efficacy of synthesized Sr-doped $MnFe_2O_4$ nanomaterials in wound healing process the antimicrobial activity against various pathogenic strains were carried out, which demonstrated the effective inhibitory growth exhibiting notable antimicrobial activity. Due to all these multifaceted properties of Sr doped $MnFe_2O_4$ hold promise for biomedical applications especially in wound healthy therapy.
Keywords: $MnFe_2O_4$: Sr doped $MnFe_2O_4$: Antimicrobial activity: Spinel Ferrite.