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Dist. Chandrapur, Maharastra

(Affiliated to Gondwana University, Gadchiroli)

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A CONFERENCE PROCEEDING ON

INTERNATIONAL CONFERENCE

On

Green Innovations in Chemistry, Physics, Mathematics & Computer Science

(ICGICPMCs - 2025)

Editors

Dr. Sunanda S. Aswale | Dr. Humeshwar D. Anande

Mr. Samirkumar R. Bhelave | Mr. Nagesh D. Dhore

Dr. Pranali K Tembhurne | Dr. Varada V. Khati

Ms. Pradnya J. Khobragade | Mr. Snehalkumar D. Kapse

Dr. Aruna Nakkella

A Conference Proceedings of

International Conference on Green Innovations in Chemistry, Physics, Mathematics & Computer Science

[ICGIPMCs – 2025]

Edited By

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Hyderabad - 500084, Telangana

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Ms. Roshani Wadettiwar
Direction
Semana Vidhy Va Vanvikas Prashikshan Mandal, Gadchiroli

Message

The Excellencies, distinguished guests, Faculty members and my dear students ..."

It is a great honor to speak before you today as we organise this International Conference on Green Innovation in Chemistry, physics, Mathematics and Computer Science "

On behalf of Semana Vidya va Vanvikas Prashikshan Mandal Gadchiroli's Gramgeeta Mahavidyalaya Chimur, a sincere welcome is extended to all delegates and speakers from around the world who have joined this conference online and also offline mode "

"This Conference on green innovation is organising at a time of unexpected challenges for environment and different opportunities related to the development.

"For these two days of conference , the critical topic of Green innovations in the subject of Chemistry, Physics, Mathematics and Computer Science will be explored. This is a vital conversation that will shape the collective future.

Though attendees come from different areas and backgrounds, they are united by a common thought that global cooperation is essential for progress, and sustainable future.

The vision for this conference is not only to exchange ideas but to build a new path toward positive outcome.

This conference focus on different crucial areas like benefits of green innovations and open opportunities to collaborate, listen, and find common ground for discussion.

Together, it is possible to build prosperous, and sustainable world for all".

Thank you once again to the dedicated organisers under the leadership of principal , the esteemed speakers, and all for the presence and commitment."

I wish renowned success for this event.

Jai Hind !

Thank you very much

Dr. Sunanda S. Aswale
Principal,
Gramgeeta Mahavidyalaya, Chimur

Message

It gives me immense pleasure to extend a warm welcome to all the distinguished guests, eminent researchers, academicians, and students participating in the International Conference on Green Innovation in Chemistry, Physics, Mathematics and Computer Science (ICGICPMCs-2025)" at Gramgeeta Mahavidyalaya, Chimur. This conference serves as a platform for intellectual discourse, collaboration, and the exchange of innovative ideas in various fields of research and conservation.

In today's rapidly evolving academic and scientific landscape, interdisciplinary research has become crucial for addressing complex global challenges. This conference aims to bring together experts from diverse fields to explore the latest advancements and innovative solutions that contribute to sustainable development and conservation.

At Gramgeeta Mahavidyalaya, we are committed to fostering a culture of research and academic excellence. This event will serves as a platform for exchanging innovative ideas and holistic learning across disciplines. I am confident that the discussions and deliberations during this conference will inspire new perspectives, encourage meaningful collaborations, and pave the way for ground breaking contributions to research and conservation.

I express my heartfelt gratitude to all the participants, keynote speakers, session chairs, and organizing committee members who have worked tirelessly to make this conference a success. I hope that this platform not only enriches your academic pursuits but also strengthens our collective commitment to research and conservation for a better future.

Wishing you all a fruitful and enlightening learning experience.

Best Regards

Dr. Shriram Kawale
Hon'ble Pro-Vice-Chancellor
Gondwana University, Gadchiroli

Message

A very good afternoon to all esteemed Colleagues, Participants, Principals of various affiliated colleges, and all the teachers-researchers who are connected virtually for this crucial International Conference.

I consider it a profound privilege to deliver the valedictory address at this important and remarkably timely event. I am sincerely grateful to the President, Chairman and Principal of **Gramgeeta Mahavidyalaya, Chimur,** for inviting me to this platform.

We are here today at the conclusion of the International Conference on ***"Green Innovations in Chemistry, Physics, Mathematics, and Computer Science,"*** jointly organized by the SIDVI Foundation, Vishakhapatnam, and Gramgeeta Mahavidyalaya, Chimur.

The theme itself is a clear recognition that we stand at a critical stage. The global landscape is rapidly changing, and our future depends on how well we prepare to meet the emerging challenges in Green Innovations for Sustainable Development.

The most profound challenges to green innovation and conservation—from climate change to resource scarcity—have a devastating impact on every vital sphere of human development: our economy, education, health, and, most acutely, the livelihoods of poor communities. To truly study and resolve these complex issues, we need a multidisciplinary approach.

This conference, by bringing together Chemistry, Physics, Mathematics, and Computer Science, has strongly demonstrated a multidisciplinary approach.

Chemistry provides the foundation for new, cleaner materials and sustainable reaction processes.

Physics offers insights into energy efficiency and revolutionary renewable technologies.

Mathematics prepares us with the models and analytics necessary for predicting environmental changes and optimizing resource use.

Computer Science delivers the innovative tools—from AI-driven efficiency to big data analysis—to scale up and manage global green solutions.

I particularly commend the organizers for a highly comprehensive selection of topics for deliberation and technical sessions. Crucially, the conference effectively attempted to focus on sustainable innovative solutions that deliberately balance the three inseparable dimensions of true sustainable development:

Economic Growth: Ensuring solutions are financially viable and create new, green economies.

Social Inclusion: Guaranteeing that the benefits of innovation reach all segments of society, especially the most vulnerable.

Environmental Protection: Safeguarding our planet for current and future generations.

With their vast knowledge, the presentations made by internationally reputed scholars have certainly helped us all to deeply understand the intricate issues connecting green innovation and Sustainable Development. I am confident that this conference has made a major contribution in not just recognizing, but actively enhancing the relevance and urgency of multidisciplinary innovations for a sustainable future.

Quality education is truly the soul of human development. By addressing and providing scientific thought on green innovative issues with both local relevance and global impact, ***Gramgeeta Mahavidyalaya, Chimur, and the SIDVI Foundation, Vishakhapatnam, Andhra Pradesh,*** have commendably fulfilled one of the prime responsibilities of a higher education institution. ***Congratulations once again on organizing such a significant conference.***

I once again thank the organizers for the opportunity to address you today on such an important topic of global relevance.

I wish you all the very best and great success for all your future endeavors.

Jai Hind, Jai Maharashtra.

Dr. Humeshwar D. Anande
Convener, IGCICPMCs-2025
Assistant Professor.,Department of Chemistry, Gramgeeta Mahavidyalaya, Chimur, Dist. Chandrapur, (M.S.), India.

Message

Message from the Convener

It is with great honor and enthusiasm that I welcome all distinguished guests, eminent speakers, academicians, researchers, scholars, and professionals to the "International Conference on Green Innovations in Chemistry, Physics, Mathematics & Computer Science (IGCICPMCs-2025)", hosted by Gramgeeta Mahavidyalaya, Chimur, Dist. Chandrapur, in collaboration with SIDVI Foundation, Visakhapatnam (A.P.).

In an era where sustainability is not just a necessity but a shared responsibility, this conference serves as a platform to foster meaningful dialogue and innovation across interdisciplinary scientific domains. The integration of green technologies and eco-conscious thinking into core sciences such as Chemistry, Physics, Mathematics, and Computer Science reflects our commitment to shaping a more sustainable and responsible future.

Through this hybrid-mode conference, we aim to encourage the exchange of transformative ideas, cutting-edge research, and practical approaches that align scientific progress with environmental well-being. I am confident that the discussions and deliberations held during the event will contribute significantly to academic scholarship and global sustainability efforts.

I express my sincere gratitude to all keynote speakers, paper presenters, session chairs, delegates, and contributors for their valuable participation. A special thanks to the organizing committee, faculty colleagues, non-teaching staff, and our collaborators for their tireless efforts in bringing this vision to life.

Wishing you a successful, inspiring, and impactful conference experience.

Warm regards,

Dr. Humeshwar D. Anande

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KEYNOTE ADDRESS
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INVITED TALK

Invited Speaker

Important Landmarks in the Human Journey of Scientific Thinking and Developments with special reference to Einstein

Dr. N.G. Belsare

Formar Principal Brijlal Biyani Mahavidyalaya, Amravati

In this lecture /article,l have tried to present a clear, well-structured overview of the major landmarks in the human journey of scientific thinking, with special reference to Einstein's role and how he reshaped that journey.

Abstract

Important Landmarks in the Human Journey of Scientific Thinking — With Special Reference to Einstein Human scientific thought has evolved through a long sequence of intellectual breakthroughs. Each stage transformed how we observe nature, formulate questions, gather evidence, and build theories. Albert Einstein occupies a central place in this progression, bridging classical and modern science.

1. Prehistoric and Ancient Scientific Thought

a) Observation and Survival Knowledge

Early humans developed systematic understanding of seasons, animal behavior, fire, tools.

These were empirical but not yet formal scientific methods.

b) Ancient Civilizations (India, Mesopotamia, China, Greece, Egypt)

Mathematics: Geometry (Egypt), algebra and arithmetic (Babylonians, Indians).
Astronomy: Calendars, planetary models.
Medicine: Ayurveda, Chinese medicine, Hippocratic methods.

c) Greek Natural Philosophy

Thinkers like Thales, Aristotle, Pythagoras, Archimedes asked foundational questions.
Aristotle's logic and causality dominated for two millennia.
Landmark: Systematic reasoning begins, but not yet experimental science.

2. Scientific Thought in the Medieval and Islamic Golden Age

Preservation and expansion of classical knowledge.
Empirical methods: Alhazen (Ibn al-Haytham) formulated early scientific method principles.
Advances in optics, astronomy, medicine, algebra (Al-Khwarizmi).
Landmark: Emergence of controlled experiment and mathematical analysis

3. The Scientific Revolution (16th–17th Century)

The shift from philosophical speculation to experimental, quantitative science.

a) Copernicus

Heliocentric model challenged Earth-centered worldview.

b) Galileo

Experimental physics, motion, telescope observations, Science grounded in measurement.

c) Kepler

Planetary laws (elliptical orbits) introduced precise mathematical astronomy.

d) Newton

Laws of motion, universal gravitation.

Unification: Earthly and celestial mechanics explained with a single framework.

Birth of classical mechanics and calculus.

Landmark: Nature becomes understandable through mathematics + experiment.

4. The Enlightenment and Rise of Modern Scientific Method (18th–19th Century)

Key Contributions

Chemistry revolution (Lavoisier),Biology (Darwin) introduces evolution and deep time.

Electromagnetism (Faraday, Maxwell) unifies electricity, magnetism, and light.

Thermodynamics and statistical mechanics (Boltzmann, Carnot).

Landmark: Science expands into unified physical laws and biological explanations.

5. Einstein's Revolution (Early 20th Century) — A Turning Point in Human Thought

Einstein's contributions mark a fundamental shift similar to Newton's. His work changed how we view space, time, matter, energy, gravity, and light.

a) 1905 — Annus Mirabilis (Miracle Year)

1. Special Relativity

Abolished absolute space and time, Introduced the constant speed of light,Unified space and time → spacetime.

2. $E = mc^2$

Matter and energy are equivalent, Foundation for nuclear physics and modern cosmology.

3. Photoelectric Effect

Light behaves as particles (quanta),Birth of quantum theory (Nobel Prize).

4. Brownian Motion

Evidence for the existence of atoms.

b) 1915 — General Theory of Relativity

Gravity is not a force but a curvature of spacetime.

Predicts black holes, gravitational waves, and an expanding universe. Einstein's Impact: He redefines the very fabric of physical reality, ends the era of classical physics, and begins modern physics.

5.Quantum Mechanics (Bohr, Heisenberg, Schrödinger, Dirac)

Though Einstein helped initiate quantum theory, he opposed some of its interpretations.

Wave–particle duality,Uncertainty principle.

Quantum fields and particles.

Landmark: Nature fundamentally probabilistic at small scales.

6. Mid–Late 20th Century to Present

Some Major Advances,DNA structure (Watson, Crick, Franklin):

Molecular biology revolution, Space exploration,Big Bang cosmology (Hubble, Gamow).

Standard Model of particle physics.

Information age: Computers, AI, Quantum technologies:

Einstein's Place in the Journey

Einstein stands at a crossroads between classical and modern thought:

Like Newton, he provided unifying theories.

Like Galileo, he redefined concepts of motion.

Like Maxwell, he connected fields and waves.

He inspired the technological, cosmological, and quantum revolutions of the 20th–21st centuries.

In short: Einstein transformed science from a description of forces acting in space and time to a description of the geometry, structure, and quantum nature of reality itself.

Advanced/Green Methods for Synthesis of Fluorinated and Other Heterocycles

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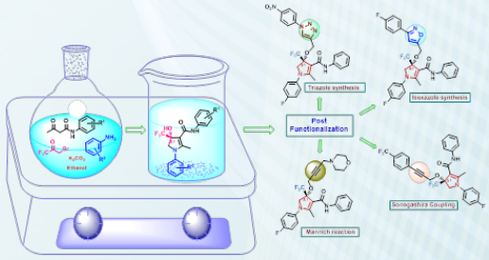
Abstract



The fluorine-substituted, (particularly trifluoromethyl-substituted) pyrrole derivatives are extensively encountered in pharmaceuticals, natural products, agrochemicals and serve as captivating building blocks in organic synthesis. This is due to the distinctive physical and biological characteristics associated with fluorine. Moreover, the trifluoromethyl group has gained recognition as the most lipophilic functional group in medicinal chemistry, enabling it to modulate electron density and basicity or enhance electrophilicity in neighbouring functional groups within a molecule. Now a days, advancing fluorinated compounds as potential drugs represents a pivotal challenge for medicinal chemistry and allied fields and hence there has been considerable interest among synthetic chemists in developing reliable synthetic methodologies for producing CF3-bearing heterocycles in recent years. We this background, A facile one-pot method for synthesis of 2-trifluoromethyl-2-ol dihydropyrroles and 4-trifluoromethyl-4-ol dihydropyrroles from various substituted amines, 3-bromo-1,1,1-trifluoropropan-2-one, and substituted β-oxoamides using K_2CO_3 as an additive has been developed. Post functionalization of resulting products into various valuable trifluoromethylated heterocycles including triazoles, isoxazoles, Mannich bases and the products from Sonogashira coupling reactions has also been reported. Additionally, a straightforward and scalable protocol for synthesis of 4- trifluoromethylpyrrole-3-carboxamide derivatives without K_2CO_3, utilizing diverse 1,3-dicarbonyl compounds has been established. This method demonstrates broad substrate compatibility, efficient tolerance towards a wide range of functional groups, making it a versatile strategy for accessing highly substituted trifluoromethylated pyrroles.

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Invited Speaker

Lanthanide Doped Upconversion Phosphor for Fingerprint Detection and High Security Application

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Abstract

Upconversion luminescence is an nonlinear optical process in which low-frequency photons are converted into high-frequency photons. This process also called as anti-Stokes process, as the emitted photons have higher energy than excited photons. The concept of anti-Stokes scattering was first discovered in the context of Raman scattering by Dr. C. V. Raman and K. S. Krishnan in 1928. In which the scattered photon gains energy by interacting with thermally populated vibrational (phonon) states of the material. However, upconversion in rare-earth-doped materials is an distinct process than Raman anti-Stokes scattering. It typically involves real intermediate energy states rather than virtual states, and the energy gain does not rely on thermal population (phonon-assisted) but rather on sequential photon absorption (photon-assisted). This work focuses on the introduction to basic optical process in lanthanide doped inorganic phosphor host, as well importance of phonon energy in effective energy transfer process in between more than one lanthanide ions to achieve high efficient UPC. Also discussed the materials methods for the synthesis of nanophase upcoversion fluoride host and their corresponding emission properties when it doped with different lanthanide pairs such as Yb/Er, Yb,Ho, Yb/Tm etc. From the spectroscopic investigation it is seen that investigation it is seen that the fluoride in an well suitable host that can emits intense green and red UCL under 980 nm laser excitation. Thus, the reported materials can find promising cope in an fingerprint detection and high Security application.

Keywords: UCL; Synthesis; Characterization; Applications

Invited Speaker

Mathematical Modelling in Heat Conduction

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Abstract

Heat transfer problems confront engineers and researchers in nearly every branch of engineering and sciences. Due to the fundamental and widespread influence heat transfer grew up as a branch of engineering sciences. The science of heat transfer is based on foundations comprising both theory and experiments. The heat transfer analysis depends on four laws such as the law of conservation of mass, the first and second laws of thermodynamics, and Newton's second law of motion. There are three particular laws such as Fourier's law of heat conduction, Newton's law of cooling, and Stefan-Boltzmann's law of radiation, which are usually employed in the analysis of conduction of heat. In this talk formulation of a general heat conduction equation with constant and variable thermal conductivity will be discussed. The equation of heat conduction becomes more general when the work term is added. The work interaction can happen in a body by means of stretching shrinking or passing electricity through it. Also, the heat conduction problem will be discussed where the work term is modeled as a heat generated by eddy current or hysteresis loss induced by the variation of a magnetic field.

Keywords: Heat conduction, Heat generation, Eddy current, Boundary value problem.

TECHNICAL SESSION I

CHEMICAL SCIENCES

ICGICPMC's202509C01

Green Chemistry: Sustainability, Industrial Applications and Green Chemistry in Education

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Abstract

Poisonous, hazardous and bio-accumulative chemical substances are reduced or eliminate completely in the green chemistry. Green chemistry involves the developing chemicals and raw materials which can be reusable or development of the processes which are very less harmful or beneficial for the environment and also living organisms. In green chemistry we identifies the sources which cause environmental damages, understand mechanism of various processes, computes the problem and try to find the materials and procedures which are safer for the environment. Green chemistry is also called sustainable chemistry it tries to solve the environmental issues by developing safe, alternative methods over popular chemical methods which are harmful to the environment. The twelve principles of the green chemistry which are given by the Paul anastas tell us about the reduction of harmful substances and methods from the synthesis and analysis. To reduce the potential of accidents like explosion at factories, outflow of poisonous gases, leakage of harmful chemicals in to the environment green chemistry can be used. Green chemistry describes to remove or reduce the use of toxic, flammable, radioactive, explosive also corrosive substance from industries and use of safer options. The present review was carried out to understand basic concepts related to green chemistry, industrial applications of green chemistry and application and implementation of green chemistry in education.

Keywords: Education, environment, Green Chemistry, Industrial Applications, Sustainable development.

ICGICPMC's202509C02

New substituted 4 amino pyridine based triazole derivatives: Synthesis, bio evaluation, and molecular docking study

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Dr. Krishnakant Waghmode
D.G. Ruparel college, Matunga Mumbai

Abstract

A series of new substituted 4 amino pyridine based triazole derivatives was efficiently synthesized via the click chemistry approach in good yields. The synthesized derivatives were evaluated for their in vitro antifungal and antibacterial activities. Antifungal activity determination was carried out against fungal strains such as *Penicillium chrysogenum, Trichoderma viride, Aspergillus niger, Candida albicans* and antibacterial strains such as *Staphylococcus aureus,* Bacillus subtilis, *Pseudomonas aeruginosa,* E.Coli. Compounds 6A, 6C, 6D and 6F displayed good potency respective to the standard drug Ciprofloxacin in antibacterial activities, with lower minimum inhibitory concentration values. Also, compound 6A, 6I and 6M displayed higher potency than the standard drug Fluconazole in antifungal activities, with lower minimum inhibitory concentration values. In addition, a molecular docking study of the newly synthesized compounds was carried out, and the results showed a good binding mode at the active site of the fungal (C. albicans) P450 cytochrome lanosterol 14α-demethylase enzyme. Derivatives.

ICGICPMC's202509C03

Ultrasonic Synthesis of Pyrazoles Derivatives for Potent Urease Inhibitors

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Abstract

An important field of study in medicine and pharmacology is enzyme inhibition. Due to biological processes, the human body generates large amounts of urea. The metalloenzyme urease, which is found in both prokaryotic and eukaryotic organisms, is essential for the degradation of urea. Overall pH levels are impacted by this process, which has an impact on agricultural areas and human health. Urease speeds up the breakdown of urea by a factor of 10^{1},, which can result in medical disorders such ammonia encephalopathy, urinary stones, catheter obstructions, pyelonephritis, and hepatic coma, even though urea naturally breaks down and is eliminated from the body. To treat these disorders, researchers from a variety of fields are actively developing methods to block bacterial urease activity.

Many medicinal molecules are known to contain heterocyclic chemicals. For these substances, however, traditional chemical synthesis techniques are frequently inefficient in terms of energy use. Compared to conventional methods, green techniques include solvent-free reactions, microwave irradiation, ultrasound-assisted (US) procedures, reactions in ionic liquids, and multicomponent reactions provide a number of benefits.

In drug development, pyrazole a five-membered heterocyclic molecule with two nitrogen atoms is very significant. We used an ultrasonic synthesis technique to create biologically active pyrazole containing hybrid analogs in order to investigate its potential. The US approach produced these chemicals more efficiently, according to the reaction kinetics.

The synthesis of pyrazole derivatives was accomplished through a two-step process. In the first step, substituted benzaldehydes were sonicated with acetone in the presence of 10% NaOH and ethanol for 20–25 minutes, affording the corresponding substituted dibenzalacetones. In the second step, the pyrazole derivatives were obtained by sonicating substituted dibenzalacetones (1:2 molar ratio) with semicarbazide, 1-amino guanidine, phenylhydrazine, or 2,4-dinitrophenylhydrazine in ethanol and glacial acetic acid for 70–90 minutes. The products were characterized by melting point determination, TLC, IR, and NMR spectroscopy. The analytical data confirmed that compounds synthesized by both conventional and ultrasound (US) methods were identical; however, the US-assisted protocol offered significantly higher yields and reduced reaction times from 12–14 hours to just 70–90 minutes. The synthesized ligands are currently being evaluated for urease inhibitory activity, and the results will be presented in the conference.

ICGICPMC's202509C04

Application of Nanotechnology to Enhance the Delivery and Efficacy of Plant Based Compounds

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Koyya Gowtham Kumar

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Keloth Basavaiah

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Abstract

The application of nanotechnology in enhancing the delivery and efficacy of plant-based compounds represents a transformative approach in the fields of medicine and nutrition. Noval drug delivery systems such as nanoparticles, liposomes, and nanosuspensions, can significantly improve the solubility, stability, and bioavailability of photochemical. These advancements enable more efficient delivery of active ingredients derived from plants, optimizing their therapeutic effects while minimizing potential side effects. By encapsulating plant-derived compounds at the nanoscale, researchers can enhance their absorption in biological systems, allowing for targeted delivery to specific tissues and cells. This targeted approach not only maximizes efficacy but also reduces the required dosage and frequency of administration, improving patient compliance. Nanotechnology facilitates the incorporation of these compounds into various formulations, including functional foods and dietary supplements, broadening their applicability. Recent studies have demonstrated the successful use of nanocarriers in delivering antioxidants, anti-inflammatory agents, and anticancer compounds sourced from plants. As research progresses, the integration of nanotechnology with traditional herbal medicine holds great promise for developing innovative therapeutic strategies. Curcumin nanoformulations are used for cancer treatment, wound healing, and neurodegenerative diseases. Nanoliposomes of quercetin are used for cardiovascular disease and neurodegenerative disorders. Gingerol nanoliposomes are used in digestive health and pain management. Overall, the synergy between nanotechnology and plant-based compounds offers a novel pathway to enhance human health, paving the way for personalized medicine and improved health outcomes.

Keywords: Plant-Based Compounds, Targeted delivery, Functional foods, Nanoformulations, personalized medicine.

ICGICPMC's202509C05

Green Synthesis, Characterization of Manganese Nanoparticles Using Natural Plant Extracts And Its Evaluation of Antimicrobial

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Abstract

The Green synthesis of metal nanoparticles is an interesting and expanding research area due to the potential applications for the ecofriendly development of novel technologies. Generally, nanoparticles are prepared by a variety of chemical and physical methods which are yield environmentally benign wastages largely. Present study reported a simple, convenient and low cost method for the synthesis of manganese nanoparticles by reducing manganese acetate with the help of easily available natural products viz., lemon extract as reducing agent and turmeric curcumin as a stabilizing agent. The curcumin was isolated from turmeric by using solvent extraction method and used for manganese nanoparticle stabilization. The characterization of curcumin and manganese nanoparticles was done by using UV- Vis and FT-IR spectroscopic techniques. The morphology of manganese nanoparticles was confirmed by SEM and TEM techniques. The size of MnNPs was in the ranges about 50nm. The antimicrobial activities of synthesized Mn nanoparticles were observed higher antimicrobial activity than the standard drug against *S. aureus, C. lunata* and *T. simii* and also exhibited similar inhibition activity to standard drug against *E. coli, C. albicans,* and *A. niger.*

Keywords: Green Synthesis, Curcumin, Extraction, Nanoparticles,Reducing and Stabilizing agent, UV–vis spectrophotometer, XRD, AFM, SEM, Antibacterial Activity.

ICGICPMC's202509C06

Development and Bioactivity Assessment of Novel Pyrimidine-Embedded Fused Heterocyclic Systems

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Abstract

Pyrimidines are produced with a variety of biological and pharmacological properties. We have created (E)-1-(1-hydroxynaphthalen-2-yl) in our work. Using 4-methoxybenzaldehyde and 1-(1-hydroxynaphthalen-2-yl) ethan-1-one in the presence of alcoholic KOH, the Claisen-Schmidt condensation reaction produces -3-(4-methoxyphenyl) prop-2-en-1-one (chalcone). Following physical and spectral methods of purification and Characterisation, Guanidine nitrate treatment in the presence of alcoholic KOH has transformed the synthesized chalcone into 2-(2-amino-6-(4-methoxyphenyl)-1,6-dihydropyrimidin-4-yl)naphthalen-1-ol (2). The structure (2) has been characterized by spectral analysis. The produced compound (2) is further reacted with ethyl 2-cyano-3,3-bis (methylthio)acrylate in the presence of catalytic quantity of potassium carbonate in DMF under reflux condition to given new Good yields of 4-(2-hydroxynaphthalen-1-yl)-2-(4-methoxyphenyl)-8-(methylthio)-6-oxo-1,6,9,9a-tetrahydro-2H-pyrimido[1,2-a]pyrimidine-7-carbonitrile (3) were obtained. At position 8, the molecule (3) has a replacement methylthio (-SCH3) group. Screenign of antimicrobial activity of synthesized compounds wad done by using disk diffusion method.

Keywords: Claisen-Schmidt Condensation; ethyl2-cyano-3,3-bis(methylthio)acrylate; Michael addition reaction; pyridopyrimidine

ICGICPMC's202509C07

Indole-Based Five-Membered Heterocycles: Synthetic Strategies, Biological Activities, and Future Perspectives

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Abstract

With a wide range of biological actions, indole and its derivatives have become useful scaffolds in medicinal chemistry. A thorough summary of recent developments (2017–2024) in the synthesis and uses of indole-based five-membered heterocycles, such as oxindoles, thiazolidinones, pyridazinones, and azetidinones, is given in this article. Their pharmacological potential as antidiabetic, anticancer, antibacterial, antioxidant, antialzheimer, anticonvulsant, and antidepressant drugs is highlighted, as are synthesis techniques and structure–activity correlations (SAR). The summary of characterization data, such as elemental analysis, mass spectrometry, FTIR, ^{1}H NMR, and ^{13}C NMR, emphasizes the structural validation of representative derivatives. Prospects and new difficulties in enhancing the pharmacological effectiveness of indole-based medication candidates are also covered in the review.

Keywords: Biological Activities, Pharmacological Potential, Elemental Analysis, Indole, Review

ICGICPMC's202509C08

Biodegradation of Polymers in Wastelands by microbial enzymes: A Comprehensive Review

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Abstract

Plastic pollution in waste land has become an important environmental concern in the 21st century. Synthetic plastics have been present in the ecosystem since long duration and posing a serious problem in an environment. Plastic flexibility combined with poor waste management has increased environmental contamination. An enzymatic biodegradation can solve this detrimental problem by catalyzing the carbon content present in plastic. Several microorganisms produce diverse range of catalytic enzymes such as peroxidase, lipase, etc. Including microbial biodegradation by bacteria, fungi and actinomycetes that produce enzymes to decompose synthetic polymers in simple compounds, show promising solution. Bacteria such as Ideonela sakaiensis, Pseudomonas putida and Bacillus subtilis and fungal species such as Tamats versicolar and Aspergillus terrace degraded plastics using oxidative enzymes. Thermoplastic such as polyethylene (PE), polypropylene (PP), Polyvinyl chloride (PVC), polyethylene terephthalate (PET), and polystyrene (PS) are widely used due to their flexibility and low cost. These synthetic plastics are highly recalcitrant and resistant to natural biodegradation. The rate of biodegradation totally depends on their chemical structure, degree of crystallinity and molecular weight of that polymer. The sources of enzymes for plastic degradation can be found in microorganisms from different environments. Enzymatic degradation of wasteland plastic is a promising policy for this critical issue. The discovery of novel enzymes such as PETase from Ideonella sakaiensis and the metabolic tracts involved in various plastic erosion provide valuable insight for bioremediation strategies. This review examines microbial plastic declining, general polymers found in waste land, highlights microorganisms and enzymes involved and factors affecting the decline. It also investigates the challenges of scaling for potential bioremediation applications and comprehensive use. Future research should focus on adaptation of conditions for microbial decline in wastelands.

Keywords: plastic, pollution, microbial biodegradation, bacteria, fungi, and actinomycetes.

ICGICPMC's202509C09

"Beta-Cyclodextrin-Schiff Base Inclusion Complex: Synthesis, Characterization, and Green Chemistry Perspectives"

Prachi P. Khobragade **Prof. Rajendra Dongre**

Abstract

The development of sustainable and environmentally friendly materials has become a pressing need in various fields, including pharmaceuticals, materials science, and chemistry. In this context, the synthesis of inclusion complexes between beta-cyclodextrin and Schiff bases offers a promising approach to enhance the solubility, stability, and bioavailability of these compounds. This study focuses on the development of an inclusion complex between beta-cyclodextrin and a Schiff base, utilizing a green chemistry approach.

The inclusion complex was synthesized using an environmentally friendly method, which minimizes the use of hazardous chemicals and reduces waste generation. The complex was characterized using various analytical techniques, including Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance (NMR) spectroscopy, and powder X-ray diffraction (PXRD). These studies confirmed the formation of a stable inclusion complex between beta-cyclodextrin and the Schiff base.

The inclusion complexation significantly enhanced the solubility and stability of the Schiff base, making it a promising candidate for pharmaceutical and industrial applications. The enhanced solubility of the Schiff base in the inclusion complex can improve its bioavailability and efficacy, while the increased stability can extend its shelf life and reduce degradation.

The green chemistry perspective of this work highlights the potential for sustainable development in materials science. The use of environmentally friendly methods and materials in the synthesis of the inclusion complex reduces the environmental impact of the process and aligns with the principles of green chemistry. This approach can be extended to the development of other inclusion complexes and materials, promoting sustainability in various fields.

The potential applications of the beta-cyclodextrin-Schiff base inclusion complex are diverse and promising. In pharmaceuticals, the complex can be used to improve the delivery and efficacy of drugs, while in materials science, it can be used to develop new materials with enhanced properties. Further studies are needed to explore the full potential of this inclusion complex and its applications.

In conclusion, the development of an inclusion complex between beta-cyclodextrin and a Schiff base using a green chemistry approach offers a promising strategy for enhancing the solubility, stability, and bioavailability of these compounds. The environmentally friendly synthesis method and the potential applications of the complex highlight the significance of this work in promoting sustainability in materials science.

Future Directions Future studies can focus on exploring the potential applications of the beta-cyclodextrin-Schiff base inclusion complex in various fields, including pharmaceuticals, materials science, and catalysis. Additionally, the development of other inclusion complexes using green chemistry approaches can further promote sustainability in materials science.

This abstract provides a comprehensive overview of the study, highlighting the significance of the green chemistry approach, the characterization of the inclusion complex, and its potential applications.

Key Words: Green synthesis of inclusion complex, Enhanced solubility and stability, Potential applications, Sustainable development through green chemistry

ICGICPMC's202509C10

Synthesis of 4-HAHF-I for Removal of As(III) from Contaminated water

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Abstract

Environmental pollution due to toxic metals is topic of major concern related to pollution control. Arsenic heavy metal is considered to be acute toxic, carcinogenic and mutagenic to living organisms and hence more hazardous, causing various diseases and disorders. For this reason, the water treatment of toxic arsenic polluted water has received an extensive concern and become a hot topic in environmental research. The aim of the present investigation is to synthesize new group of copolymer 4-HAHF-I was synthesis by condensing 4-hydroxyacetopheone, hexamine with formaldehyde in molar ratio (1:1:2) in the presence 2M HCl. Different characterized such as elemental analysis, FTIR and XRD used to determine the structure and characteristics of 4-HAHF-I. The removal of carcinogenic As(III) from contaminated water by adsorption using 4-HAHF-I was investigated by batch experiment method. The maximum removal of As(III) by absorption 4-HAHF-I was observed to be 84.23 %. Thus the new copolymer 4-HAHF-I under study can be successfully used as an efficient adsorbent material for removal of As(III).

Keywords: Copolymer, Characterization, Heavy Metals, Batch experiments, Adsorption.

ICGICPMC's202509C11

Effect of Various synthesis methods On structural and Morphological insights of Layered Double Hydroxides

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Abstract

Layered double hydroxides (LDHs) materials find extensive applications in numerous field such as medical sciences, industrials sector, agriculture and food, catalysis, polymer, nanotechnology, etc. The LDHs properties like structural, textural, morphological can be design for achiving required materials for particular application in scientific areas. In the current investigation, we have synthesized mesoporous nanostructured LDHs materials via microwave, sonication and stirring methods. The nanostructured LDHs was scientifically characterized by various physico-chemical technique like XRD, N2 sorption, FT-IR. Electron microscopy like SEM, FE-SEM, TEM, HR-TEM. On the basis of experimental study, it can be evidently witness that nanostructured LDHs materials was formed good crystalline mesoporous nature. Microwave and sonication techniques furnished regularly dispersed well developed flower shaped nanocrystals, however stirring methods gives mostly agglomerated nano-sized platelets. The mechanistic insights for fabrication of nanostructured LDHs via microwave, sonication and stirring process were also highlighted.

Keywords: Nanostructured materials, flower-shaped nanocrystals, Layered double hydroxide, Microwave, Sonication.

ICGICPMC's202509C12

Ball Milling Method: A Green Tool for Synthesis of N-Heterocycles

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Abstract

The ball milling technique has arisen as a sustainable and effective method for synthesizing N-heterocycles, an essential category of molecules extensively used in medicines, agrochemicals, and materials research. This green mechanochemical method obviates the need for hazardous solvents and severe reaction conditions, providing an ecologically friendly alternative to conventional synthetic pathways. Ball milling utilizes mechanical energy to induce chemical transformations, enabling the rapid, high-yield, and selective synthesis of N-heterocyclic frameworks in solvent-free or low-solvent environments. This abstract outline the basics of ball milling, its benefits for energy efficiency, diminished waste, and scalability, as well as its applications in the synthesis of several N-heterocycles, including pyridines, quinolines, and imidazoles. Recent developments and problems in improving reaction parameters and broadening substrate scope are examined, highlighting the promise of ball milling as a revolutionary instrument in green chemistry for sustainable organic synthesis.

Keywords: Ball-Milling, Green Chemistry, N-heterocycles.

ICGICPMC's202509C13

Effect of Stirring Time on Mg–Al–CO_3 Layered Double Hydroxides and Application in Furfural Aldol Condensation

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Abstract

This study explores the effect of stirring duration on the structural and morphological development of Mg-Al-CO_3 layered double hydroxides (LDHs). The materials were prepared using a co-precipitation method with stirring times ranging from 6 to 24 hours and analyzed by Fourier transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD), and field-emission scanning electron microscopy (FESEM). XRD results verified the successful formation of well-crystallized LDHs, with crystallite sizes increasing progressively from 46.5 Å to 83.5 Å as stirring time was extended. FESEM micrographs displayed flower-like architectures with clearly defined petal-like features, underscoring the strong influence of stirring time on morphological evolution. The catalytic properties of the synthesized LDHs were further assessed in the aldol condensation reaction between furfural and acetone, revealing that both crystallinity and morphology govern product distribution and selectivity. These findings emphasize that stirring duration is a key parameter in modulating the structure, particle size, and catalytic efficiency of Mg-Al-CO_3 LDHs.

Keywords: Co-precipitation, Layered double hydroxide, Crystallite size, Stirring time, Aldol Condensation of Furfural.

ICGICPMC's202509C14

"Biodegradable and recyclable catalysts: Green Innovations in Organic Synthesis"

Dr. Sandeep Nivruttirao Niwadange

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Abstract

The pursuit of sustainable chemical processes has driven significant interest in the development of biodegradable and recyclable catalysts for organic synthesis. Traditional catalysts, though effective, often pose challenges such as toxicity, high cost, and environmental persistence. In contrast, biodegradable catalysts derived from natural polymers, bio-based ligands, and enzyme systems offer eco-friendly alternatives that minimize waste and toxicity. Moreover, recyclable catalysts, including supported metal nanoparticles, magnetic nanocatalysts, and heterogeneous organocatalysts, enable multiple cycles of use without significant loss of activity, thereby improving cost efficiency and reducing chemical waste. Innovations in catalyst design, such as polymer-supported organocatalysts, deep eutectic solvent systems, and bio-inspired catalytic frameworks, demonstrate remarkable efficiency in C–C, C–O, and C–N bond formation under mild conditions. These advances not only align with the principles of green chemistry but also highlight the potential of catalysts to reduce energy consumption and environmental impact in industrial and pharmaceutical synthesis. The integration of biodegradability with recyclability provides a promising pathway toward next-generation catalysts that combine performance, sustainability, and circular economy benefits.

Keywords:- Green Catalysis; Biodegradable Catalysts; Recyclable Catalysts; Organic Synthesis; Sustainable Chemistry; Eco-friendly Catalysis; Nanocatalysts

ICGICPMC's202509C15

Ultrasonic velocity, Free Length, Relative Association, Relaxation Time, Of Cymbopogon Citratus Leaves Extracts In Aqueous Solvent

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Abstract

Ayurveda is the science of life. Ayur means health and veda means knowledge. Along with the progression of human's aptitude, medicine has also improved. In the ancient time people used plants, herbs to cure various diseases. This resulted in the advancement of a system of medicine for the benefit of human life. A principle characteristic of Ayurveda remains in its proficiency to figure out and define the fine vitalities and intellect running in our bodies. Cymbopogon citratus which is known to show antifungal activity is used for present research work. Ultrasonic velocity, density, viscosity measured experimentally for the mixture of leaves extract of Cymbopogon Citratus in doubly distilled H2O with a number of concentration at twenty five, thirty, thirty five degree Celsius taking constant frequency of 3 Mhz. Factors like compressibility, free length, relative association, relaxation time, acoustic impedance proves useful in forecast and check the molecular interactions, these have been conclude by quantifying the velocity, density & viscosity of ready solution. The result is in good agreement with the results proposed by Eyring and Kincaid model. The study of mentioned thermoacoustic parameters suggests strong intermolecular interactions between solute and solvent.

Keywords: Ultrasonic Velocity, Compressibility, acoustic impedance, molecular interactions.

ICGICPMC's202509C16

Synthesis And Chelate Ion Exchange and Thermal Degradation Studies of Terpolymer Resin-Iii: 4-Hydroxybenzophenone-Gaunidine-Formaldehyde (4-Hbpgf-Iii)

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Abstract

By using condensation method newly copolymer 4-HBPGF-III synthesized. This polymer synthesized in 3:1:5 ratio of 4-Hydroxybenzophenone, Gaunidine and Formaldehyde by using acetic acid as a medium. The terpolymer is well studied with the help of UV-visible, FTIR, NMR, SEM and various spectrometric. On the basis of various spectral technique like UV-visible, FTIR, NMR the structure of the resin have been predicted. The molecular weight of copolymer was determined with the help of non-aqueous conductometric titration. The semi crystalline nature is determined with the help of Scanning electron microscopy (SEM) and XRD. At different pH selectivity for different ions is studied with the help of batch equilibrium ion exchange method. Thermal study of the newly synthesized copolymer was carried out to determine its mode of decomposition and relative thermal stabilities. Non-isothermal thermogravimetric analysis technique is used in which sample is subjected to condition of continuous increase in temperature at linear rate. The Freeman-Carroll and Sharp-Wentworth methods have been used in the present investigation to calculate thermal activation energy and different kinetic parameter of the copolymer resins. The advantage of Freeman-Carroll method is to calculate both the order of reaction (n), activation energy and different thermogravimetric parameters.

Keywords: Synthesis, Condensation, characterization, structure, Thermal Gravimetric Analysis, ion exchange.

ICGICPMC's202509C17

Ultrasonic study of Antibiotic drug Ampicillin Sodium at Different Temperatures at 2MHz

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Abstract

Information about physico-chemical properties and nature of molecular interaction in liquid mixture get by measuring ultrasonic velocity in them. Acoustic parameters gives information about various inter and intra molecular interactions in solution. Ultrasonic velocity, density and viscosity measurement have been carried out on 0.01 molar aqueous solution of ampicillin sodium at different temperatures 303.15K, 308.15K and 313.15K and frequency 2MHz. From measured data, various acoustical properties like intermolecular free length, specific acoustic impedance, adiabatic compressibility, relative association, relaxation time, free volume, Rao's constant and Wada's constant have been calculated. The results of acoustic and thermodynamic properties have further been used to interpret the nature and strength of molecular interactions in the aqueous solution of ampicillin sodium.

Key words: Density, viscosity, ultrasonic velocity, molecular interactions, ampicillin sodium

ICGICPMC's202509C18

Evaluated design of PAMAM-Based Magnetic Nanocomposite for the adsorption of Heavy metals

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Abstract

The hazardous contaminants of water, such as heavy metals, impose vital effects on human and animal health. Hence, decontaminating such pollutants from the novel PAMAM-based framework grafted on the silica-coated Fe3O4 magnetic nanoparticles, Fe3O4-SiO2@NH2@G1-OV is a promising material that preferably removes heavy metals(HMs) such as Cd(II) and Pb(II). Characterization techniques, including elemental analysis, FTIR, SEM-EDX, HR-TEM, XPS, TGA/DTA, BET, and XRD, were used to evaluate the nanocomposite. The adsorbent possesses the active dendritic functional groups –CONH and azomethine ligand group, such as -OCH3, -N=CH-, and –OH functionalities, which have enhanced the adsorption of metal ions. Moreover, the silica-coated Fe3O4 surface also increased the adsorption rate. The adsorption experiments have revealed that the maximum adsorption capacity (qm) of 1.77 mmol.g-1 for Pb(II) and 1.44 mmol.g-1 for Cd(II) ions was displayed at pH 6-7 and with the contact time of 180 mins for Pb(II) and 240 min for Cd(II) metal ions. The Langmuir adsorption isotherm and pseudo-second-order kinetic model appropriately addressed the uptake of Pb(II) and Cd(II) metal ions, elucidating the mechanism of the adsorption phenomenon. The PAMAM-based composite has high adsorption capacity for the removal of heavy metals in environmental remediation.

Keywords: Dendrimer, PAMAM-Fe3O4, adsorption, magnetic nanocomposite, nanoparticle, Cd+2, Pb+2.

ICGICPMC's202509C19

New Schiff base: A colorimetric sensor for detection of copper and silver ions in aqueous medium

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Abstract

A new Schiff base receptor 9 was prepared for the detection of Cu2+ and Ag+ in aqueous solutions. Receptor 9 showed highly selective and sensitive chromogenic response towards Cu2+ and Ag, respectively. The selectivity toward Cu2+ or Ag+ was not interfered by other metal ions. The detection limits for Cu2+ and Ag+ ion were determined as (5.82 ± 0.03) ×10-6 M and (8.95 ± 0.07) ×10-10 M, respectively. Thus, the receptor 9 can be used as a practical, highly sensitive chromogenic sensor for the determination of Cu2+ and Ag+ in aqueous medium.

Keywords: Colorimetric; Cu2+ and Ag+ ions; Dual chemosensor; Aqueous medium; semi-quantitative

ICGICPMC's202509C20

Hematological Study of Channa Punctata with Reference to Trypanosomiasis

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Abstract

The present study investigates the hematological alterations in Channa punctata (Bloch), a freshwater fish, with special reference to trypanosomiasis caused by blood-borne protozoan parasites of the genus Trypanosoma. Hematological parameters are highly sensitive indicators of physiological and pathological changes in fish and serve as valuable biomarkers of health status. Infected specimens of C. punctata were examined to assess changes in erythrocytic and leukocytic profiles, hemoglobin concentration, and hematocrit values in comparison with healthy individuals. Results revealed a significant reduction in red blood cell count, hemoglobin levels, and packed cell volume, indicating an anemic condition in infected fish. Conversely, white blood cell count showed a marked increase, suggesting an active immune response against the parasite. Morphological abnormalities such as anisocytosis, poikilocytosis, and nuclear deformations in erythrocytes were also recorded. These findings highlight the detrimental impact of trypanosome infection on the hematological health of C. punctata, which could ultimately affect its survival, growth, and ecological role in aquatic ecosystems. The study emphasizes the importance of hematological analysis as a diagnostic tool for fish diseases and provides baseline data for monitoring parasitic infections in freshwater fishes.

Keywords: Channa punctata, hematology, trypanosomiasis, erythrocytes, leukocytes, fish health

ICGICPMC's202509C21

Silver Nanoparticles Based Chemo sensors: A New Horizon for Cadmium Detection

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Abstract

Water pollution caused by toxic heavy metals is a serious problem. The most dangerous metals, cadmium, cause physiological problems in humans, such as coronary artery disease, kidney failure, stomach disorders, and so on. This provides the data to trace and analyse toxic metals such cadmium by Silver nano sensors with a variety of optical properties. Nano sensors are most sensitive for quick determination of metal ions. Different kinds of nano sensors are utilised for the trace analysis of toxic metal ions. Alanine Functionalized silver nanoparticles analysis by using UV-visible, FTIR, SEM analysis. It is exact and greatly reproducible in the identification of Cd2+, in real samples such as tap water, drinking water, and industrial effluents, indicating the wide practical application. The development of chemo sensors for Cd2+ is of great interest for onsite monitoring.

Keywords: Toxic Metal Cadmium; Nano sensor; colorimetric; trace analysis; onsite monitoring

ICGICPMC's202509C22

Comparative Acoustic Study of Antimalarial Drugs at Different Concentrations

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Abstract

The present study investigates the comparative acoustic properties of selected antimalarial drugs at varying concentrations to explore their molecular interactions and solution behaviour. Acoustic parameters such as ultrasonic velocity, density, and viscosity were measured across different molar concentrations, and derived thermodynamic functions—including adiabatic compressibility, intermolecular free length, and acoustic impedance—were calculated. The variations in these parameters were analyzed to assess solute–solvent and solute–solute interactions in aqueous and non-aqueous media. Comparative evaluation of the drugs revealed distinct trends in acoustic responses, indicating differences in molecular association, hydration effects, and structural modifications with concentration. These findings provide insights into the physicochemical behavior of antimalarial drugs in solution, contributing to a deeper understanding of drug–solvent interactions, which may have implications in pharmaceutical formulation and drug delivery systems.

Key Words: Ultrasonic velocity, antimalarial drugs, molecular interaction, acoustic parameters

ICGICPMC's202509C23

Photoluminescence Study of $Ca_2B_2O_5:Eu^{3+}$ Phosphor Synthesized by Combustion Method for near-UV Solid-State Lighting Applications

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Abstract

Rare-earth Eu^{3+} activated $Ca_2B_2O_2$ phosphor was successfully prepared via a combustion method. The phase purity and crystalline structure of the prepared phosphor were validated using X-ray diffraction (XRD) analysis, and its luminescence properties were studied through photoluminescence (PL) measurements along with CIE coordinate evaluation. The Eu^{3+} activated $Ca_2B_2O_2$ phosphor exhibited PL characteristics with three emission peaks at 597 nm, 615 nm, and 626 nm, with the dominant peak observed at 615 nm under 395 nm excitation. The prepared phosphor demonstrated excellent color purity based on its CIE coordinates, and an optimized doping concentration of 0.5 mol% was identified as suitable to minimize concentration quenching. These findings indicate that the Eu^{3+} activated $Ca_2B_2O_2$ phosphor is a promising candidate for near-UV-excited solid-state lighting and display applications.

Keywords: Photoluminescence, XRD, combustion method, Rare-earth doped, phosphor, solid state lightning

ICGICPMC's202509C24

Sonication-Assisted Solventless Synthesis of Betti Bases Catalyzed by Sulfanilic Acid: A Green Approach

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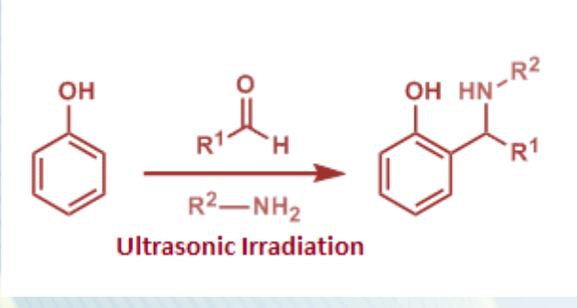
Abstract

A rapid and eco-friendly protocol for the synthesis of Betti bases [1-(α-aminoalkyl)naphthols] has been developed using ultrasonic irradiation under solvent-free conditions. Betti bases are well-recognized for their applications in medicinal chemistry, catalysis, and materials science, and therefore, the establishment of sustainable synthetic methodologies is of considerable interest. In this study, a three-component condensation of 2-naphthol, aromatic aldehydes, and aliphatic amines was efficiently catalyzed by Sulfanilic Acid (10 mol%) under ultrasonic conditions. The application of sonication significantly accelerated the reaction, affording the desired Betti bases in excellent yields (90–93%) within only 50–60 minutes. Both cyclic and acyclic aliphatic amines were well tolerated, and the method proved effective with a wide range of aromatic aldehydes bearing either electron-donating or electron-withdrawing substituents. The use of ultrasonic irradiation not only shortened reaction times but also enhanced yields. The present method offers notable advantages over traditional protocols that typically require heating, longer reaction times, or environmentally hazardous solvents. Sulfanilic acid, being inexpensive, non-toxic, and recyclable, further enhances the green character of this approach.



Scheme 1. Schematic diagram for synthesis of Betti bases

Keywords: Sulfanilic acid, Solvent-free synthesis, Sonication, Green Chemistry.

ICGICPMC's202509C25

Secondary Metabolites in Traditional Medicinal Plants

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Abstract

Plants have been utilized for medicinal purposes since the ancient Sumerian population. Numerous phytochemical constituents are present in plants responsible for many pharmacological effects. These natural phytochemical constituents divided into two categories namely primary metabolites and secondary metabolites. Primary metabolites play crucial role in the living cell processes viz. plant growth and reproduction. Whereas secondary metabolites are organic substances directly involved in the plant defense, systemic resistance and other ecological functions. Plant cells produced numerous secondary metabolites through primary metabolic pathways. Secondary metabolites with various biological effects provide scientific base for the use in traditional medicines. A good knowledge of chemical composition leads to the better utilization of medicinal plants. Ancient communities use many herbs in the traditional medicines to cure diseases. On the basis of chemical structures secondary metabolites are classified into several classes like phenols, alkaloids, saponins, terpenes lipids and carbohydrates. These compounds are responsible for the diverse medicinal effects which includes antibacterial, anti-inflammatory, anti-oxidants etc. Plant secondary metabolites were considered not only waste product but as a specialized single substance with specific characteristics that originated from different chemical functional groups and they can be useful in pharmaceutical industry for discovering new bio-drugs for different purposes. Modern scientific research validates the long-standing traditional uses of medicinal plants by isolating and studying their secondary metabolites. These natural compounds are a significant source for new drugs and inspire the development of modern pharmaceuticals. By integrating traditional knowledge with scientific understanding, researchers can unlock new therapeutic interventions for various health conditions, promoting holistic health and well-being.

Keywords: Secondary metabolites, phenols, antibacterial, bio-drugs

ICGICPMC's202509C26

A Field Study on Butterflies Diversity in Chimur District Chandrapur, India

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Abstract

Butterflies are the most fascinating, attractive, and beautiful among the large group insect. They are highly sensitive to environmental changes and serve as excellent bio-indicators of the ecosystem. A study on butterfly diversity was carried out in Chimur taluka district Chandrapur of Maharashtra, India. Balaji Sagar Lake and the Gramgeeta Mahavidyalaya, these two sites selected for the study area for the surveyed of butterflies. A total of 75 individuals and 12 species of butterfly belong to 4 families were documented during the one year study. The Balaji Sagar Lake is situated middle of the city and having large no trees and shrubs around and the Gramgeeta Mahavidyalaya, Chimur present outside city on the Nagpur Highway and having moderate no of trees and shrubs and crops. The present study was conducted to document and analyses the community structure, richness and diversity of butterflies in both site. Nymphalidae was the richest family that comprised (43%) of the total species of butterfly recorded in the study area followed by Pieridae (31%), Papilionidae and Lycaenidae families were the lowest (14%) each respectively. The Balaji Sagar Lake have determining number of butterflies were observed (48) and Gramgeeta Mahavidyalaya (27) minimum number of butterflies recorded. Among the species of butterfly observed in the study area, 4 of them were abundantly and 2 species were common while 8 numbers of the species of butterfly were less common. In addition 7 numbers of the species of butterfly were occasionally oberved. The study area is rich in butterfly diversity and further research could be conducted to obtain more details and documentation on butterfly diversity for the conservation and butterfly park.

Keywords: Diversity, Butterflies, Nymphalidae, Pieridae, Balaji Sagar Lake, Gramgeeta Mahavidyalaya Chimur.

ICGICPMC's202509C27

Phyto-Fabrication of Cobalt Oxide Nanoparticles: A Review

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Abstract

The field Nanotechnology is rapidly developing towards sustainable and environmentally friendly methods for the synthesis of nanomaterials. This report focuses on a growing area Plant extract-mediated synthesis of cobalt oxide nanoparticles (Co3O4 NPs) offers a more environmentally friendly alternative to conventional physical and chemical methods, which often involve hazardous chemicals and high energy consumption. We provide a comprehensive overview of the principles and mechanisms of this biogenic approach and highlight their various roles Phytochemically- such as polyphenols, flavonoids and alkaloids - act as both reducing agents and sequestering agents. This article examines several plant sources that have been used successfully, including leaves, fruits, and roots, and discusses how the choice of plant extract affects the outcome. Morphology, size and crystallinity from Co3O4 NPs. Also summarize the most important characterization Various techniques such as XRD, FTIR, TEM, and SEM are used, which are very important to confirm the successful synthesis and determine the properties of the nanoparticles. Subsequently, diverse applications of these biosynthesized nanoparticles are explored, with a particular focus on their promising performance. Catalysis, energy storage (e.g., supercapacitors), biomedical fields (e.g., antibacterial and anticancer agents), and environmental remediation (e.g., photocatalytic dye degradation). Finally, this review highlights the current challenges and future perspectives, highlighting the need for a deeper understanding of synthesis mechanisms and the potential for large-scale, low-cost production for a variety of industrial and technological applications.

Keywords: Green synthesis, Cobalt oxide nanoparticles (Co3O4 NPs), Plant extract, Biogenic synthesis, Nanomaterials, Phytochemicals.

ICGICPMC's202509C28

Effect of Contaminated Soil on Seed Germination and Plant Growth of Wheat Crop

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Abstract

The extensive cutting of forests, extraction of minerals, and the conversion of grazing lands for urban development have caused significant harm to the environment and contributed to severe climate changes. The release of toxic effluents from industrial sectors, automobiles, and high-flying aircraft has exacerbated the situation. The dangers associated with soil pollution arise from the increasing population of the planet, juxtaposed with the fact that the earth's natural resources remain largely fixed and limited. As a result, soil becomes increasingly contaminated with hazardous chemicals, leading to the entry of micro-organisms into the food chain, air, and water, which are ultimately consumed by humans.

The primary contributors to soil pollution include industrial waste, urban waste, radioactive pollutants, agricultural pollutants, chemical and metallic pollutants, and mining activities. Among all these causes, industrial pollution, agricultural pollution, and chemical and metallic pollution are particularly hazardous in relation to environmental degradation, as they can emit various types of pollutants, including heavy metals. Heavy metal contamination in agricultural soils has become a pressing environmental concern, jeopardising crop productivity, food quality, and public health worldwide. Wheat (Triticum aestivum L.), being a fundamental food crop, faces significant risks from heavy metals like cadmium, lead, and mercury, which stem from industrial processes, agricultural practices, and contaminated water sources. The primary aim of this study was to assess how contaminated soil affects seed germination and the growth of wheat plants.

The findings revealed significant decreases in germination percentage, average seedling length, and total biomass with rising heavy metal concentrations. The presence of these metals not only hindered germination and seedling development but also led to observable symptoms, including chlorosis, root deformation, and reduced shoot elongation.

The study highlights the critical necessity for monitoring and remediation approaches in agricultural soils, as persistent contamination jeopardises both sustainable wheat production and food safety. The results underscore the importance of adopting effective crop and soil management strategies to reduce the movement of toxic metals into the human food supply.

Keywords: Wheat, contamination, seed germination, plant growth, soil pollution, food safety, environmental remediation

ICGICPMC's202509C29

Synthesis and Characterization of Rare Earth (Sm, Er) Borohydride Complexes Supported by N-Aryliminopyrrole Ligands for Catalytic Applications

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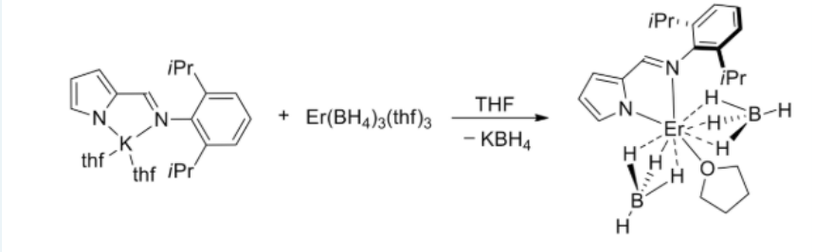
Abstract

This research presents the synthesis and characterization of novel samarium (Sm) and erbium (Er) borohydride complexes stabilized by the N-aryliminopyrrole ligand [2-(2,6-$iPr_2C_6H_3N$=CH)-C_4H_3NK]. The study focuses on the coordination chemistry of rare earth borohydrides, with particular emphasis on the structural influence of pyrrolyl-based supporting ligands. The isolated complexes were thoroughly characterised using multinuclear NMR, FT-IR, and single-crystal X-ray diffraction, which confirmed the chelating role of the iminopyrrole ligand and showed distinct coordination geometries between Sm and Er centres. Structural comparison highlighted that Sm complexes favored higher coordination numbers, while Er species adopted more compact geometries, consistent with the ionic radius differences between the two metals. In addition to structural insights, these complexes were tested as precatalysts in model hydroboration and hydrosilylation reactions. Sm-based complexes showed superior activity in the hydroboration of ketones, whereas Er derivatives displayed higher selectivity in olefin hydrosilylation. The catalytic activity was strongly influenced by the borohydride coordination environment, suggesting that the ligand framework not only stabilizes the complexes but also modulates substrate activation.

Overall, this work expands the chemistry of lanthanide borohydrides by introducing N-aryliminopyrrole-supported systems, providing both fundamental understanding of their coordination behavior and practical relevance for catalytic applications. These findings highlight the potential of rare earth borohydride complexes as tunable platforms for designing efficient and selective catalytic systems.



Scheme 1. Schematic diagram for synthesis of rare earth metal borohydride

Keywords: Rare earth metals; Samarium; Erbium; Borohydride complexes; N-aryliminopyrrole ligand; Coordination chemistry; Catalysis.

ICGICPMC's202509C30

Beyond Traditional Methods: Novel Approaches in Real-Time Water Quality Monitoring and Prediction

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Abstract

Real-time water quality monitoring and prediction are essential to safeguarding public health and ensuring sustainable management of water resources amid increasing environmental challenges. Traditional methods relying on periodic sampling and laboratory analysis often fail to capture rapid changes and spatial variability in water quality, limiting their effectiveness in timely decision-making. This review article examines novel approaches that transcend these conventional techniques by leveraging advances in sensor technology, communication networks, and intelligent data analytics.

Recent developments in Internet of Things (IoT) enabled sensor networks facilitate continuous, distributed, and real-time monitoring of key water quality parameters such as pH, turbidity, dissolved oxygen, temperature, and conductivity. These systems enhance the spatial and temporal resolution of data collection, enabling early detection of pollution events and dynamic water system assessment. Complementing these hardware advancements, machine learning and artificial intelligence methods provide powerful tools for processing large volumes of streaming data, enabling accurate prediction, anomaly detection, and forecasting of water quality trends under varying environmental conditions.

Furthermore, the integration of digital twin models with blockchain technology offers a transformative approach to enhancing system reliability and data security. Digital twins create dynamic, virtual representations of water networks that can simulate various scenarios, supporting proactive management strategies. Blockchain technology ensures data integrity and transparency through decentralized, tamper-proof ledgers, while enabling automated enforcement of regulatory compliance via smart contracts.

Despite the significant progress, several challenges persist, including sensor calibration and maintenance, energy consumption, data heterogeneity, cyber security threats, and the scalability of monitoring systems across large or complex water distribution networks. This review synthesizes the current state of technology and research, highlights existing limitations, and proposes future directions focused on developing robust, scalable, and adaptive real-time water quality monitoring and predictive frameworks. These advancements hold promise for more effective water resource management, pollution control, and public health protection across diverse environmental and socio-economic settings.

Keywords: Real-time water quality monitoring, Internet of Things (IoT), Machine learning, Digital twin, Blockchain, Sensor networks, Water quality prediction.

ICGICPMC's202509C31

Analysis of physico –chemical parameters of Palasgaon Lake in Chimur Taluka, District-Chandrapur (M.S.). India

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Abstract

The physico-chemical parameters are water temperature, electric conductivity, total dissolved solids, total hardness, total alkalinity, turbidity, pH, dissolved oxygen, chlorides, COD , BOD, etc. The biological factors considered were macro-zoo benthos and plankton of the lake. Nearest city to Palasgaon Lake is Chimur and the Lake is situated in Chimur Taluka of Chandrapur District of Maharashtra in India. In the present study an attempt has been made on physico –chemical parameters of a rural perennial water body, located in Palasgaon in Chimur Taluka District Chandrapur of Maharashtra. The current study was conducted during the period of one year i.e., August-2024 to July-2025. The samples were analyzed at monthly intervals for a period of one year. Physico-chemical parameters are an important criterion for determining the suitability of water for irrigation and drinking purpose. Palasgaon Lake has greatest importance for humankind. Lake was highly productive as presence of various class and order of benthos, zooplankton and phytoplankton although there were no sign of problem like eutrophication. Physico-chemical parameters studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food and the fisherman catches the fishes from this lake and sold in weekly market at nearby villages.

Keywords: Humankind, COD, parameters, productive, Lake.

ICGICPMC's202509C32

Review of Luotonin A

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Abstract

Luotonin A, a naturally occurring quinazoline alkaloid first isolated from Peganum nigellastrum, has attracted significant attention due to its structural resemblance to the clinically important camptothecin alkaloids. Unlike camptothecin, Luotonin A exhibits a simpler chemical framework, better synthetic accessibility, and promising biological activities, particularly as a topoisomerase I inhibitor. Over the past two decades, extensive efforts have been devoted to the synthesis, structural modification, and pharmacological evaluation of Luotonin A and its analogues, aiming to improve their potency, selectivity, and pharmacokinetic properties. In addition to anticancer potential, derivatives of Luotonin A have demonstrated antimicrobial, anti-inflammatory, and neuroprotective activities, further broadening its therapeutic scope. This review provides a comprehensive overview of the isolation, biosynthesis, chemical modifications, structure–activity relationships, and biological activities of Luotonin A, highlighting its significance as a versatile lead scaffold for drug discovery and development.

Keywords: Pharmacokinetic, anti-inflammatory, structure–activity relationships.

ICGICPMC's202509C33

Exploring the Electrical And Magnetic Characteristics of Hnpmdnp Metal Complexes

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Abstract

A new Schiff base ligand, HNPMDNP, was synthesized by the condensation of 2-hydroxy-5-nitrophenyl(phenyl)methanone with 2,4-dinitrophenylhydrazine. The ligand was characterized by spectroscopic techniques including IR and NMR, confirming the formation of the hydrazone linkage. Metal complexes of the ligand were prepared and studied for their structural and physicochemical properties. The complexes were investigated using IR spectroscopy to assign coordination modes, while electronic transitions were examined through UV–Visible diffuse reflectance spectra. The electrical conductivity measurements revealed semiconducting behavior of the complexes and their magnetic properties were evaluated using the Gouy balance method, indicating varied magnetic moments corresponding to the nature of metal ions and coordination environment. These combined studies provide valuable insights into the structure–property relationships of HNPMDNP and its complexes, establishing their potential in electrical and magnetic applications.

Keywords: HNPMDNP, Electrical conductivity, Magnetic susceptibility, hydrazone linkage, semiconducting behavior

ICGICPMC's202509C34

Influence of Ni-Sn Substitution on Structural and Magnetic Properties of M type Calcium Hexaferrite

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Abstract

Nanocrystalline CaFe12-2X(Ni-Sn)XO19 (X= 1.4, 1.6, 1.8, 2.0) M type Calcium hexaferrite were successfully prepared by using microwave assisted sol-gel auto combustion technique, by using nitrates as cations and urea as fuel. The effect of co-substitution of Ni2+ and Sn4+ on morphology and magnetic properties were examined in detail. The Structural and magnetic characteristics were studied by using X-ray diffraction(XRD), Fourier transform infrared spectroscopy(FTIR), transmission electron microscopy(TEM), Scanning electron microscopy(SEM) and vibrating sample magnetometer(VSM). The FTIR and XRD reveal the formation of M-type hexaferrite. The results shows that value of saturation magnetization (Ms) increases with doping concentration, for x= 1.4, saturation magnetization(Ms) is 11.05 emu/gm and for x=2.0 saturation magnetization(Ms) increases to 19.80 emu/gm. The value of coercivity reduced from 121 Oe to 64 Oe.

Keywords- Hexaferrites, saturation magnetization, coercivity, magnetic properties.

ICGICPMC's202509C35

Copper(II)-Based Polychelate with DAPG: A Structural Study

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Abstract

The synthesis and structural analysis of metal-polychelate complexes have garnered significant interest due to their diverse applications in catalysis, materials science, and biomedical fields. The resin abbreviated as DAPG was prepared by polycondensation of 2, 6 diaminopyridine (0.1M) and glycerol (0.4M) in presence of DCC (dicyclohexylcarbodiimide) at 900C. The polychelate of [CoII(DAPG)2]n was prepared by using metal salts and DAPG ligand in DMF medium. The structure of the polychelate was elucidated by elemental analysis, FTIR spectroscopy as well as UV- Visible spectral studies confirmed the octahedral geometry of the complexes.

A bioactive ligand known for its chelating ability and multifunctional groups. The complex formation was confirmed using a range of analytical and spectroscopic techniques. UV-Visible spectroscopy revealed characteristic d–d electronic transitions and ligand-to-metal charge transfer bands, indicative of coordination between Cu(II) ions and the DAPG ligand. Infrared (IR) spectroscopy showed significant shifts in the C–H aromatic stretching and N–H stretching vibrations, confirming the involvement of nitrogen donor atoms in coordination to the metal center. Thermogravimetric analysis (TGA) demonstrated good thermal stability of the complex with stepwise degradation patterns corresponding to the loss of coordinated ligands and the polymeric framework.

Magnetic susceptibility measurements indicated a high-spin octahedral geometry around the copper center, with magnetic moment values consistent with unpaired electrons typical of Cu(II). Elemental analysis and metal content estimation supported the proposed molecular formula of the polychelate. Based on the spectral and analytical data, a structural model was proposed where the DAPG ligand coordinates to Cu(II) through its nitrogen donating atoms, forming a three-dimensional coordination polymer. This coordination imparts enhanced stability and unique physicochemical properties to the complex.

This study contributes to the growing field of bio-ligand-based metal polychelates by elucidating the coordination behavior of copper with DAPG and demonstrating the potential of such complexes for applications in catalysis, antimicrobial materials, and environmentally friendly technologies. The facile synthesis, combined with comprehensive structural characterization, establishes a foundation for further investigations into the functional properties of Cu(II)-DAPG polychelates

Keywords: Copolymer, polycondensation, polychelate, Resin, spectral study, Thermogravimetric analysis.

ICGICPMC's202509C36

Advances in Eco-Friendly Catalysts & Functional Materials

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Abstract

Eco-friendly catalysts & materials encompasses substances and technologies that facilitate chemical reactions or function as materials while striving to reduce environmental harm. This field is crucial to green chemistry, sustainable engineering, and the advancement of clean energy solutions. Eco-friendly catalysts lower energy usage, prevent harmful by-products, and are either recyclable or biodegradable. Eco-friendly catalysts find its application in sustainable chemical production, pollution mitigation (e.g., catalytic converters), energy generation (e.g., hydrogen fuel cells) and water treatment. Sustainable materials are the materials obtained in a responsible manner, causing minimal disruption to ecosystems and designed to be biodegradable or recyclable, non-harmful, robust and environmentally friendly throughout their lifecycle.

Keywords: Eco-friendly catalysts, Eco-friendly materials, Environment

ICGICPMC's202509C37

Ultrasonic and absorption spectroscopic studies of CuCl2 (Transition metal salt) in aqueous and 5 % alcoholic medium

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Abstract

Ultrasonic velocity and absorption studies of $CuCl_2$ solutions have been carried out in aqueous and 5% (v/v) alcoholic media over the temperature range 20–40 °C. Experimental measurements of ultrasonic velocity (u) and absorption coefficient (α) were complemented by density and viscosity data to evaluate derived acoustic parameters such as adiabatic compressibility (β), acoustic impedance (Z), and intermolecular free length (L_f). The results reveal systematic variations with both solute concentration and solvent composition, reflecting changes in ion–solvent interactions and the structural modifications of the medium. In aqueous medium, Cu^{2+} ions act as structure-making species, leading to increased velocity and reduced compressibility, whereas the addition of alcohol perturbs the hydrogen-bond network, producing distinct acoustic behavior. Absorption data, analyzed in terms of α/f^2, indicate relaxation phenomena associated with ion–solvent dynamics. Complementary UV–Visible spectroscopic studies display characteristic d–d transitions of Cu(II) ions, with noticeable shifts in band position and intensity as a function of solvent polarity and temperature, consistent with changes in coordination and solvation. These combined ultrasonic and spectroscopic investigations provide valuable insights into solute–solvent interactions, structural effects, and relaxation processes in transition metal salt solutions.

ICGICPMC's202509C38

Review on Cyclodextrin Inclusion Complex: Preparation Methods and Influencing Factors

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Abstract

Inclusion Complex formation is supported by non-covalent interaction between host and guest molecules. Cyclodextrins are supramolecular hosts with distinct structural characteristics that can enclose a diverse spectrum of viable compounds. The toroidal shape of CD offers the hydrophobic environment in the cavity where the guest moieties are entrapped which undergoes the physicochemical transformation and results into a superior physical, chemical and biological profiles. This review describes the chemical behavior of pharmaceuticals, both natural and synthetic, as well as other related compounds complexed with cyclodextrins. The study focuses on the commonly employed preparation methods of inclusion complexes and influencing factors to demonstrate host-guest interaction. The study demonstrates the possible stoichiometric combinations of cyclodextrins with the active pharmaceutical and organic molecules. The review also provides instances of synthetic pharmaceuticals that have combined with cyclodextrin to create inclusion products, demonstrating how cyclodextrins can be exploited to create biological substances with novel features and advance therapeutic research.

Keyword: Cyclodextrin, β-Cyclodextrin, inclusion products

ICGICPMC's202509C39

Traditional Knowledge and Nutritional Potential of Wild Vegetables Consumed by Tribal Communities in Gadchiroli District, Maharashtra: A Comprehensive Review

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Abstract

Wild vegetables have been integral to traditional food systems of tribal communities in Gadchiroli district, Maharashtra, serving as crucial sources of nutrition, medicine, and livelihood security for centuries. This comprehensive review synthesizes existing ethnobotanical knowledge and nutritional research on wild edible plants consumed by indigenous communities, particularly the Gond, Madia, Kawar, and Pardhan tribes inhabiting this biodiversity-rich region of eastern Maharashtra.

Ethnobotanical surveys across various tahsils of Gadchiroli district have documented 73 wild edible plant species with significant representation from trees (49.3%), herbs (30.1%), climbers (9.6%), and shrubs (8.2%). These species are utilized for their fruits (43.2%), leaves (22.22%), seeds (12.34%), roots and tubers (8.64%), stems and bark (6.17%), flowers (6.17%), and whole plants (1.23%). The documented species span across 52 genera and 32 dicotyledonous families, along with 15 genera from 9 monocotyledonous families.

Nutritional assessments of selected wild vegetables, including Amaranthus tricolor, Holorrhena pubescens, Nelumbo nucifera, Celastrus paniculatus, Cucumis melo, and Dendrocalamus strictus, reveal exceptionally high nutritional values. These plants demonstrate significant protein content (8.2-11.59g per 100g dry weight), carbohydrates (up to 51.47g), dietary fiber, and essential minerals, often exceeding cultivated vegetables' nutritional profiles. Bioactive compounds including saponins, phenols, flavonoids, alkaloids, and phytosterols underscore their potential as functional foods with medicinal properties.

Traditional ecological knowledge encompasses sophisticated understanding of seasonal availability patterns, sustainable harvesting practices, and diverse preparation methods including consumption as vegetables/chutneys (49.33%), raw/ripe fruits (45.33%), pickles (4%), and roasted seeds (1.33%). This knowledge system represents centuries of co-evolution between indigenous communities and forest ecosystems, contributing significantly to food security during scarcity periods.

However, this invaluable biocultural heritage faces severe threats from habitat destruction, overexploitation, climate change impacts, and rapid erosion of traditional knowledge systems. The review highlights the critical need for integrating traditional knowledge with modern scientific approaches to unlock wild vegetables' full potential for nutrition security, biodiversity conservation, and sustainable livelihood enhancement. This comprehensive analysis underscores wild vegetables' significant role in addressing contemporary challenges of malnutrition, food insecurity, and biodiversity loss, positioning traditional food systems as viable solutions for sustainable development in tribal regions of Maharashtra.

Keywords: Wild vegetables, Gadchiroli district, tribal communities, ethnobotany, traditional knowledge, nutritional assessment.

ICGICPMC's202509C40

Synthesis of Silver nanoparticles by green route using Clitoria Ternatea flower extract

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Abstract

The synthesis of silver nanoparticles (AgNPs) using plant extracts has gained significant attention as an eco-friendly and green approach due to the advantages of biocompatibility, reduced toxicity, and cost-effectiveness. This study focuses on the biosynthesis of silver nanoparticles using the aqueous extract of Clitoria ternatea (commonly known as butterfly pea), a plant renowned for its rich phytochemical content including flavonoids, phenolics, and alkaloids. The extract acts as both a reducing and stabilizing agent in the nanoparticle formation process. The synthesis was monitored by observing a color change and characterized using UV-Vis spectroscopy, which confirmed the surface Plasmon resonance of Ag NPs in the range of 400- 450 nm. Preliminary results indicate that Clitoria ternatea extract effectively reduces silver ions to form stable nanoparticles with significant antioxidant, antimicrobial, and potential therapeutic properties. The study underscores the potential of Clitoria ternatea as a green synthesis agent for developing cost-effective nanomaterials for diverse biomedical and environmental applications.

Keywords: Silver nanoparticles, Surface Plasmon, flower extract, phytochemical, green route

ICGICPMC's202509C41

Empowering Sustainabiliy through Nanomaterials: Green Chemistry Approaches and Applications

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Abstract

Green chemistry is fundamentally different approach that protects human and environmental health by replacing hazardous chemicals, processes, and products with safer processes, and products with safer alternatives.Designing and development of nanomaterials are revolutionizing sustainable innovation which provide more safer and efficient solutions for various industries and fields. Role of green chemistry principles empower the sustainability by eco friendly approaches and the use of renewable resources, and safety standards in production and application.Conversion of waste ito valuable substances is another aspects of sustainability through green chemistry principle which enhance the productability like pivoting agrarian waste into useful products, This paper demonstrate how green chemistry can unravel environmental issues. These nanomaterials ensure the reduction of harmful chemicals and minerals and improvement of technological potential in the different fields. The significant progress in nanotechnology and related areas is highly commercialized and addressed. Reliability of green chemistry is in the production of nanomaterials without the generation of harmful waste materials. This emerging field is sufficiently able to control the hazards produced by nanotechnology with the help of green, eco-friendly synthesis. The basic mechanism that pillars the green chemical innovation of nanomaterials is the usage of the least toxic compounds as raw materials. Also, this uses cost-effective resources, biodegradable materials, energy-specific reactions, and safe chemicals

Keywords: Nanomaterials, Green chemistry, Sustainability, Environmental Health, Hazardous Chemicals.

ICGICPMC's202509C42

A Review: Biosynthesis of Metal Nanoparticles and their uses in Environmental Applications

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Abstract

Nanotechnology is one of the emerging interdisciplinary fields that is receiving a lot of attention and is significantly influencing pharmacology, agriculture, and the environment. Although there are many methods for creating nanoparticles, such as laser ablation, sol-gel, mechanical milling, spinning, and chemical deposition, the process is not suitable for continuous production due to its high cost and use of dangerous chemicals. The need for sustainable, economically feasible, and ecologically friendly development strategies has therefore increased recently. The microbial synthesis of nanoparticles, which combines the disciplines of microbiology and nanotechnology, is one of the environmentally friendly techniques utilized for sustainable production. The current review details how bacteria, fungi, yeast, and other microorganisms can biosynthesize gold, silver, and other metal nanoparticles, including platinum, palladium, and molybdenum nanoparticles.

Keywords: Nanotechnology, Metal Nanoparticles, Biosynthesis, Microbial, Environment, Applications.

ICGICPMC's202509C43

Measuring tree Diversity Status of Community Managed Forest of Chandrapur District by Shannon-Weiner Index

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Abstract

The present study is a sincere effort to measure tree diversity status of the Community Managed Forest of the Chandrapur district of the Maharashtra state of India. In the Chandrapur district, two community managed forests, that is, Panchgaon and Sitaram peth were selected for the present study. 20 quadrats of dimension 25m X 20m were sampled at each forest area by applying belt transact method. All the trees inside the quadrat having GBH (Girth at breast height) ≥ 30 cm identified, counted and noted down. Then, the Shannon-Weiner index was calculated for both the sampled area to measure their tree diversity status. Generally, the values of Shannon-Weiner index ranges from 1 to 5, the values nearer to 1 indicates poor diversity and the values nearer to 5 indicates higher diversity.

The calculated Shannon-Weiner index value for the Panchgaon village forest is found to be 3.2834, and for the Sitaram village forest it is 3.4473. It indicates that the tree diversity status of both the community managed forest is very good.

Key words: Belt transact method, Shannon-Weiner index, Panchgaon, Sitaram peth.

ICGICPMC's202509C44

Impact of Municipal Solid Waste Dumping Site on Groundwater Quality in Chandrapur City, Maharashtra, India

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Abstract

Most of the world's population specially in rural areas are mainly dependent on groundwater for drinking water and domestic purposes. Disposal of municipal solid waste in unscientific manner can pose serious threat to the environment and surrounding area. One of the major threats is groundwater pollution that may occur due to leachate percolation in soil containing harmful contaminants of waste. This study aims to assess impact of municipal solid waste landfill site on its surrounding groundwater quality of Chandrapur city Maharashtra, India. About twenty groundwater samples were collected from the dumping site and its vicinity. The physicochemical parameters analyzed such as pH, temperature electrical conductivity, calcium, magnesium, total alkalinity, nitrate, sodium, fluoride, sulphate, ammonia, potassium, lead, cadmium, chromium, nickel, copper, zinc, DO, TDS, Total hardness, chloride, BOD, COD, Iron by using analytical techniques (IS: 3025). Dissolved oxygen and total dissolved solids present in groundwater samples were found to be low as compared to given limit. Results for BOD and COD were found to be higher than standard guideline values. The concentration of heavy metals in groundwater samples for lead, cadmium, chromium, nickel, copper, zinc were found to be very low. To evaluate risk associated to the residential area a detailed study of the site is most important

Keywords: Groundwater pollution, heavy metal, landfill leachate.

ICGICPMC's202509C45

Water Quality Assesment by Using Physico-Chemical Parameters

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Abstract

Water is most important natural resource after air. Water is necessary for distinct purposes.

As we know, the surface of water is mostly covered by water but very small part of it is usable. Therefore, this precious gift of nature and limited resource must be utilized very carefully. As water is required for different purposes, the suitability of it must be checked before use. The applicability of it must have to be checked before use. The origin of water must be coordinated regularly to determine whether they are in sound health or not1. Nowadays, It is very difficult to use water directly because of contamination and pollution. So various treatments are used before it is used for drinking or for industrial processes. If water bodies are in poor conditions that they are contaminated. They are the indictor of environmental degradation; it is also a threat to the ecosystem. Thus, the quality of water is very important in both environmental and economic aspects2. Present investigation deals with the collection of few water samples from kelapur tahsil and used to asses comprehensive physico-chemical paramters like pH, TDS, Total hardness, Chlorides, turbidity, alkalinity etc. The results are used to interpret the water quality.

Keywords: Water quality, Water analysis, Contamination of water

ICGICPMC's202509C46

Exploring the Electrical and Magnetic Characteristics of HNPMDNP Metal Complexes

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Abstract

A new Schiff base ligand, HNPMDNP, was synthesized by the condensation of 2-hydroxy-5-nitrophenyl(phenyl)methanone with 2,4-dinitrophenylhydrazine. The ligand was characterized by spectroscopic techniques including IR and NMR, confirming the formation of the hydrazone linkage. Metal complexes of the ligand were prepared and studied for their structural and physicochemical properties. The complexes were investigated using IR spectroscopy to assign coordination modes, while electronic transitions were examined through UV–Visible diffuse reflectance spectra. The electrical conductivity measurements revealed semiconducting behavior of the complexes and their magnetic properties were evaluated using the Gouy balance method, indicating varied magnetic moments corresponding to the nature of metal ions and coordination environment. These combined studies provide valuable insights into the structure–property relationships of HNPMDNP and its complexes, establishing their potential in electrical and magnetic applications.

Keywords: HNPMDNP, Electrical conductivity, Magnetic susceptibility, hydrazone linkage, semiconducting behavior.

ICGICPMC's202509C47

Green Chemistry

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Abstract

Green chemistry, also known as sustainable chemistry, is a philosophy and approach to chemical research, design, manufacture, and application that minimizes or eliminates the use and generation of hazardous substances.

Key Word

. Pollution Prevention:

. Twelve Principles:

. Minimizing Hazards:

. Sustainability:

. Applications:

Pillars of green chemistry

Objectives -

Scope-

Future of green chemistry -

Principles of Green Chemistry

Green chemistry is a crucial approach for creating a more sustainable and environmentally responsible future. It encourages scientists and engineers to think critically about the environmental impact of their work and to develop innovative solutions that benefit both society and the planet

The ultimate aim of green chemistry is to entirely cut down the stream of chemicals pouring into the environment

ICGICPMC's202509C48

Original Synthesis and Study of ARYL Substituted 1,3-Thiazole and its Nanoparticles as Antibacterial Agents

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Abstract

The synthesis, spectral analysis and biological activities of 5-phenyl-2-hydroxy-chlorosubstituted-2-amino-1,3 thiazoles have been carried out. In this case 5-(2′-hydroxy-3′ ,5′-dichlorophenyl)-4-(4″-nitr obenzoyl)-2-amine-1,3-thiazole (D) has been screened. The compounds D was synthesized from 1-(2′- hydroxy-3′ ,5′-dichlorophenyl)-2-bromo-3-(4″-nitrophenyl)-1,3-propanedione (a4) by the action of thiourea. The nanoparticles of the compounds D has been prepared by using ultrasonic technique. The newly synthesized titled compound and it's nanoparticles were screened for their antibacterial activity against some pathogens ; Gram+ve bacteria viz. Staphylococcus pneumoniae, Staphylococcus aureus and Gram-ve bacteria viz. Escherichia coli and Pseudomonas fluorescens by using Agar disc diffusion method. All the newly synthesized compounds were found to be active against test pathogens.

Keywords : Chalcone, thiazine, diphenylthiourea, antibacterial assay.

ICGICPMC's202509C49

Environmental Chemistry for a Sustainable and Green Future

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Abstract

Environmental chemistry plays a pivotal role in advancing the global agenda of sustainability and shaping a green future by integrating scientific understanding with eco-friendly practices. The discipline focuses on the sources, reactions, transport, effects, and fates of chemical species in air, water, soil, and living organisms, thereby providing a foundation for addressing critical environmental challenges such as climate change, air and water pollution, soil degradation, waste accumulation, and depletion of natural resources. In recent decades, rapid industrialization, urbanization, and unsustainable agricultural practices have led to a surge in chemical emissions and pollutants, intensifying ecological imbalance and threatening human health. Environmental chemistry not only aids in monitoring and assessing environmental pollutants but also in developing sustainable technologies such as green chemistry, bioremediation, renewable energy production, advanced water purification systems, and eco-friendly materials. By minimizing hazardous substances and promoting circular economy concepts, environmental chemistry helps in reducing the carbon footprint, conserving biodiversity, and ensuring intergenerational equity. Furthermore, the field emphasizes the integration of chemical innovations with global environmental policies, including the United Nations Sustainable Development Goals (SDGs), particularly those related to clean water and sanitation, affordable and clean energy, climate action, responsible consumption and production, and life on land and below water. The growing importance of environmental chemistry lies in its multidisciplinary approach—linking chemistry with ecology, biology, engineering, and policy sciences—to design sustainable solutions that align with ecological principles. This paper explores the critical role of environmental chemistry in fostering a green revolution of the 21st century, highlighting advances in sustainable chemical processes, waste management, renewable resource utilization, and environmental monitoring tools. It also underlines the need for continued research, innovation, and global cooperation to ensure that chemical sciences evolve as a driver of sustainability rather than an agent of ecological harm. Through its scientific, technological, and societal contributions, environmental chemistry stands as a cornerstone in achieving a sustainable and green future for humanity and the planet.

Keywords: Environmental Chemistry, Sustainability, Green Chemistry, Eco-friendly Technologies, Resource Conservation, Green Future.

ICGICPMC's202509C50

Eco-Friendly Catalysts in Green Synthesis: Role of Polyaniline Zirconium Oxide, Iodine, Methanesulfonic Acid and Ionic Liquids

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Abstract

The development of eco-friendly catalysts has emerged as a sustainable alternative to conventional methods in organic synthesis. Catalysts such as polyaniline–zirconium oxide (PANI–ZrO_2), iodine, methanesulfonic acid (MSA), and ionic liquids like N-methylpyridinium tosylate have demonstrated significant efficiency in promoting multicomponent and one-pot reactions under mild conditions. These catalysts offer advantages including reusability, low toxicity, operational simplicity, and enhanced product yields, thereby minimizing the use of hazardous reagents and solvents. PANI–ZrO_2 nanocomposites provide a high surface area and excellent stability, facilitating heterogeneous catalysis. Iodine, as a green Lewis acid catalyst, supports the synthesis of nitrogen and oxygen containing heterocycles. MSA serves as a biodegradable Bronsted acid with strong catalytic activity and negligible environmental hazards. Furthermore, ionic liquids such as N-methylpyridinium tosylate act as non-volatile, tunable media and dual-function catalysts, enhancing selectivity and reducing waste generation. Collectively, these eco-friendly catalytic systems highlight a promising approach towards sustainable and environmentally benign synthetic methodologies.

Keywords: Eco-friendly catalysts, polyaniline zirconium oxide, iodine, methanesulfonic acid, ionic liquids, N-methylpyridinium tosylate, green chemistry, sustainable synthesis.

TECHNICAL SESSION II

COMPUTER SCIENCE

ICGICPMC's202509CS1

Comparative Study of Encryption Algorithms in Hadoop for Secure Big Data Processing

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Abstract

The exponential growth of big data has necessitated secure and efficient processing frameworks, with Hadoop emerging as a leading solution for distributed storage and computation. However, ensuring confidentiality and integrity in such environments requires robust encryption mechanisms. This paper presents a detailed comparative study of encryption algorithms in Hadoop, focusing on symmetric (AES, DES, 3DES, Blowfish), asymmetric (RSA), and hybrid approaches (CP-ABE combined with AES and RSA). Using reported and digitized experimental data across datasets of 1 GB, 5 GB, and 10 GB, performance is evaluated in terms of encryption time and throughput. Results reveal that traditional algorithms such as DES and 3DES exhibit poor scalability, while AES and Blowfish demonstrate moderate efficiency. Parallelized implementations via MapReduce significantly improve performance, with AES-MR achieving the highest throughput (~270 MB/min for 10 GB). Hybrid models provide a strong balance between performance and advanced security features, making them the most practical choice for secure big data environments. The findings establish that combining MapReduce parallelization with hybrid encryption offers a scalable and resilient solution for Hadoop-based big data security.

Keywords: Hadoop distributed file system (HDFS); big data security; data encryption; data decryption

ICGICPMC's202509CS2

Computer Science in Indian Education System

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Abstract

While the Indian education system exposes computer science education at an early age, the system is highly exam-centric, and students rely on rote learning rather than problem-solving, innovation, and creativity. Institution level practical exposure is often weak with schools and colleges possessing outdated computer labs, which often means students are learning practical on paper, preventing them from having active learning in the subject. In many institutions, curriculum is outdated and does not satisfy industry requirements in, for example, (Robotics, Artificial intelligence, Machine learning, or Cybersecurity). The education system also suffers from an access element, where urban and rural divides exist in terms of access to learning hardware and software. This aspect of the education system has forced many bright students to emigrate, take degrees abroad, leading to brain drain. Regardless, India continues to produce one of the largest and significant pools of software engineers in the world and retains a position in providing IT services to the global marketplace. The NEP (National Education Policy) 2020 will introduce coding to students in class 6, and the policy encourages students to develop critical thinking and problem solving; there is an excess number of startups, and continued development of Indian tech leaders. Some may argue that the system is backward; it is advancing to a more contemporary, practical, decentralized model that is skill based.

ICGICPMC's202509CS3

Performance Analysis of Encryption Techniques for Digital Image Security

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Abstract

In the digital era, securing image data has become increasingly critical due to the widespread use of digital images in fields such as healthcare, military and personal communication. Due to faster growth in multimedia technology, internet and cell phones, there is a need for Digital image encryption techniques in order to hide images from such attacks. It is necessary to protect confidential Digital image data from unauthorized users. To detect and find unauthorized users is a challenging task. There is a need for image encryption techniques in order to hide Digital images from such attacks.

An Encrypting images techniques scrambled the pixels of the image and decreased the correlation between the pixels resulting in lower to obtain the encrypted image, digital images often carry critical and confidential information that must be protected from unauthorized access, tampering and data breaches. Ensuring the confidentiality, integrity and authenticity (CIA) of image data has therefore become a priority in secure communication systems. Traditional symmetric encryption algorithms such as Data Encryption Standard (DES), Triple DES (3DES) and Advanced Encryption Standard (AES) have been widely used for securing image data but they often face limitations in terms of performance, key management and resistance to modern cryptographic attacks. When the image is encrypted with graphics fusion technology, the cipher text presents a randomness which makes the possibility of deciphering reduced. The analysis focuses on key performance metrics including encryption and decryption time, histogram uniformity, information entropy, correlation of adjacent pixels, Peak Signal-to-Noise Ratio (PSNR) and robustness against statistical and differential attacks. The results demonstrate that while AES provides a balanced trade-off between speed and security.

This study introduces and evaluates the High Performance Secure Encryption Algorithm (HPSEA) alongside DES, 3DES and AES to assess their comparative performance in digital image encryption. HPSEA significantly enhances both encryption strength and computational efficiency by combining advanced transformation techniques and optimized key management. This study concludes that HPSEA offers a promising alternative to traditional encryption methods for securing digital images in modern high-speed and high-security applications.

Keyword: Image, Pixel, CIA, PSNR, DES, 3DES, AES, HPSEA.

ICGICPMC's202509CS4

Artificial Intelligence for Human Recognition: A Survey of Techniques and Challenges: A Review

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Abstract

Human recognition has been one of the most important areas of research in artificial intelligence (AI) due to its extensive applications in security, surveillance, healthcare, biometrics, and human-computer interaction. Conventional methods of recognition have long faced issues of environmental variations, low scalability, and low robustness. With the advent of machine learning and deep learning approaches, recognition capabilities have improved considerably and allowed systems to learn with greater accuracy and flexibility in true-world scenarios.

This survey provides an extensive overview of AI-based human identification methods using various modalities such as face, gait, voice and speech, and multimodal biometric fusion. All the modalities are discussed regarding methodologies, pros, cons, and real-world applications. The review highlights how the role of deep neural networks, convolutional architectures, and feature extraction methods has helped in performance gains, along with weaknesses like adversarial attacks and spoofing.

The review opines that while AI has transformed human recognition, much remains to be done in making it fair, secure and ethically adopted. A balanced approach combining technical innovation with governance will be required for full exploitation of AI-based human recognition in a safe and sustainable way.

Keywords: Artificial intelligence, Human recognition, Face recognition, Gait analysis, Voice and speech recognition, Multimodal biometrics, Deep learning and Ethical AI.

TECHNICAL SESSION III

PHYSICAL SCIENCES

ICGICPMC's202509P01

Thermoacoustic Study in a Ternary Liquid Mixture of Ethanol, n-Heptanol, with Cinnamaldehyde at Different Temperatures

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Abstract

Thermoacoustic studies provide significant insight into the molecular interactions of multicomponent liquid mixtures. In the present work, a ternary mixture of ethanol, n-heptanol, and cinnamaldehyde has been studied at various temperatures to investigate the roles of hydrogen bonding, dipole–dipole interactions, and steric effects on acoustic and thermodynamic parameters. Ultrasonic velocity and density measurements were carried out at varying mole fractions and temperatures (298 K, 303 K, and 308 K). From these data, parameters such as adiabatic compressibility, acoustic impedance, intermolecular free length, molar sound velocity, and Wada's constant were calculated. The variation of these parameters with composition and temperature indicates the presence of specific interactions between hydroxyl groups of alcohols and the carbonyl group of cinnamaldehyde. The results suggest strong associative interactions at lower temperatures and partial disruption of hydrogen bonding at higher temperatures.

Keywords: cinnamaldehyde, ethanol, Wada's constant, free length, n-heptanol, acoustic compressibility.

ICGICPMC's202509P02

Effect of Different Back Contacts on the Cu_2O/TiO_2 thin Film Solar Cell Characteristics

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Abstract

Nowadays, global energy demand is growing tremendously due to increased population, rapid industrialization, and the widespread use of digital technologies in every aspect of our daily lives. Fossil fuels such as coal, oil and natural gas are the primary sources of energy. Combustion of these fossil fuels ejaculates huge amount of carbon dioxide gas (CO_2) which causes air pollution. Besides, fossil fuels are limited as well as they are not sustainable sources of energy. These shortcomings of fossil fuels have compelled scientists to find out the alternative source of energy. Solar cell can overcome these limitations because it is a renewable and sustainable source of energy. Moreover, it does not induce any pollution in environment. Semiconducting metal oxides have recently become fundamental research materials for manufacturing thin film solar cells. Lot of theoretical and experimental studies has been done on the thin film solar cells by various researchers since last few decades. In this study, FTO/n-TiO_2/p-Cu_2O/Ni structured solar cell has been selected for simulation through SCAPS-1D software. It is a one-dimensional simulation tool developed by Prof. Marc Burgelman and his associates in the University of Gent, Belgium. To examine the role of different back contacts on the solar cell parameters, different metals like Cu (4.6 eV), Fe (4.8 eV), Mo (5.0 eV), Ni (5.22), Au (5.47 eV) have been used as back contacts step by step during simulation. In addition, thickness and donor concentration of window layer are respectively set 0.3 µm and 1017 cm-3, and absorber layer thickness is varied from 0.5 µm to 6.0 µm keeping acceptor density of 1018 cm-3. It is observed from the simulation results that cell parameters (J_{SC}, V_{OC}, FF, and PCE) are significantly influenced by the back contact metals, and these parameters are larger at operating temperature of 300 K when Ni metal is used as back contact of the device. The optimized values of short circuit current density (J_{SC}), open circuit voltage (V_{OC}), fill factor (FF) and power conversion efficiency (PCE) are respectively 11.358 mA/cm2, 1.1748 V, 84.88 % and 11.33 %.

Keywords: Work function, heterojunction, solar cell, thin film, SCAPS-1D.

ICGICPMC's202509P03

Synthesis and characterization of Dy^{3+} doped $Sr_3Al_2O_6$ Phosphors via Wet chemical method for Down-Conversion Applications

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Abstract

Down-conversion phosphors play a vital role in improving the efficiency of optoelectronic devices, especially in light-emitting diodes (LEDs) and photovoltaic cells. In this work, $Sr_3Al_2O_6$ phosphors doped with rare earth ions Dy^{3+} were synthesized using a wet chemical method. The structural, morphological, and photoluminescent properties of the phosphors were systematically investigated. X-ray diffraction (XRD) confirmed the formation of a pure cubic $Sr_3Al_2O_6$ phase. Scanning Electron Microscopy (SEM) revealed uniform particle morphology. Photoluminescence (PL) studies showed characteristic emissions of Dy^{3+} (yellow and blue bands), The photoluminescence (PL) spectra of Sr3Al2O6; Dy3+ ,excited at 351 nm, which exhibit two distinct emission peaks at 486 nm and 578 nm, corresponding to the 4F9/2→ 6H15/2 and 4F9/2→ 6H13/2 transitions of Dy3+ respectively. The photoluminescence (PL) excitation spectrum of Sr3Al2O6; Dy3+ with a 1% Dy3+doping concentration, monitored at an emission of 486 nm. The observed decay time was τ= 2.25 µs. for Sr3Al2O6: Dy3+. Thus Dy3+ doped Sr3Al2O6 phosphor validating their potential as down-conversion materials for solid-state lighting and display devices.

ICGICPMC's202509P04

Investigations on Physical properties of nickel ferrite nanoparticles using sol-gel auto combustion technique

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Abstract

Nanocrystalline nickel ferrite (NiFe2O4) has been synthesized by the sol-gel auto combustion method using citric acid as a precursor. The physical properties of nano nickel-ferrite were confirmed by X-rays diffraction (XRD) and transmission electron microscope (TEM) analysis. NiFe2O4 belongs to the class of ferrites with inverse spinel structure having structural formula Fe3+ [Ni2+Fe3+] O4. Surface morphology studies reveal that the average grain size of nickel ferrite was found to be 20nm.

Keywords: Sol-gel Auto Combustion; X-rays diffraction; Transmission electron microscope.

ICGICPMC's202509P05

Recent Advances in Ferrite Materials Applications in Optoelectronics Devices and Green Energy

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Abstract

Recent Advances in ferrite materials have garnered significant attention in the optoelectronics domain, particularly within the specialized electronics and green energy sectors. This review paper synthesizes recent research highlighting the unique properties of ferrite materials, such as their magnetic and optical characteristics, which enhance their performance in various applications. Emphasis is placed on the development and optimization of ferrite-based devices, including photovoltaic cells, light-emitting diodes, and magnetic sensors, which demonstrate considerable potential for sustainable technologies. Additionally, the integration of ferrite materials with other semiconductor compounds is discussed, revealing synergies that could propel advancements in functional devices. Ferrite materials in their spinel structures present a large variety of interesting properties which include high magnetic permeability, low eddy current losses, and very good chemical stability. These put forth that they are very much so for use in many applications which include electromagnetic interference shielding, microwave absorption, and photovoltaic devices. In this review we look at the synthesis and characterization of ferrite materials which also includes the study of the role of doping, nanoscaling, and hybridization on their optical, electrical, and magnetic properties. Today we look at what is present and what is to come in terms of ferrite materials' role in optoelectronic devices and green energy which we put through the lens of what more research and development is required to see out their full value. This review we present is meant to be a full report of what has been achieved recently in the field of ferrite materials and their applications which we put forward as a resource for researchers, scientists and engineers in materials science, optoelectronics and renewable energy The implications of these developments for future research and commercial applications are explored, making a compelling case for the continued investigation of ferrites in advancing optoelectronic technologies aligned with environmental sustainability goals. This review encompasses a comprehensive outlook on the current state of ferrite materials and their transformative role in the future landscape of energy-efficient solutions. Keywords: ferrites, electronics, magnetic, optoelectronics, green energy, semiconductors, light-emitting devices, photovoltaic cells.

ICGICPMC's202509P06

Supercapacitor exploration: A Review

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Abstract

Sol-gel was used to create new solid solutions of nano quaternary metals from MgFe2O4 and ZnMn2O4. Using Fourier transform infrared (FTIR) spectroscopy and the X'Pert High Score Plus application, phase analysis was used to investigate the formation of a solid solution and the resulting phase. To ascertain the lattice parameters, crystallite size, various cations distribution, and elemental analysis of the solid solutions that were generated, Rietveld analysis of X-ray diffraction data (XRD), scanning electron microscopy (SEM/EDS), and transmission electron microscopy (TEM) were used. The composition ratio (x) is shown to have an effect on the measured dielectric characteristics of the produced solid solutions. At ferroelectric Curie temperature (Tc), the solid solution (1-x) Mg Fe2O4/(x)Zn Mn2O4samples showed a ferroelectric–paraelectric transition.

We also looked at the various hopping mechanisms in the various samples. The impact of composition ratio (x) on the cathodic and anodic potential was examined, and the electrochemical performance was tested. In addition to the kind of cations that formed oxides, the composition ratio (x) determined the electrodes' specific capacitance (Cs) value. As a supercapacitor material, the (0.9)MgFe2O4/(0.1)ZnMn2O4 sample performed the best. EIS inspection further validated the (0.9)Mg Fe2O4/(0.1)Zn Mn2O4 electrode's exceptional electrochemical properties. The synergistic effects and activation of the solid solution materials during the CV cycle may be responsible for the exceptional stability of the Mg Fe2O4/Zn Mn2O4 solid solution.

Keywords: Synthesis Method, Characterization, Performance, Electrochemical properties.

ICGICPMC's202509P07

Advancing Renewable Energy Through Floating Solar Technologies

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Abstract

The global transition toward sustainable energy has intensified the need for innovative technologies that can overcome the limitations of conventional renewable systems. Solar photovoltaic (PV) remain one of the fastest growing energy sources; however, land-based solar farms face challenges such as high land costs, limited availability of suitable sites, and competition with agriculture or urban development. Floating solar technologies, also known as floating photovoltaic (FPV) systems, provide a novel solution by utilizing the surfaces of reservoirs, lakes, and other calm water bodies for solar deployment. This approach not only reduces pressure on land resources but also enhances the efficiency of solar panels, as the natural cooling effect of water minimizes thermal losses and improves energy conversion rates. Beyond clean power generation, FPV systems deliver several co-benefits. By shading water surfaces, they reduce evaporation, conserve freshwater, and suppress algae growth, contributing to water security and ecosystem balance. Their compatibility with hydropower facilities offers opportunities for hybrid renewable energy systems, which can enhance grid stability and optimize infrastructure use. Economically, FPV projects minimize land acquisition costs and are becoming increasingly competitive as material innovations and scalable designs reduce overall expenses.

Despite their promise, FPV technologies face challenges related to structural durability, environmental impacts, and adaptability to variable weather and water conditions. Concerns about effects on aquatic biodiversity, the long term resilience of floating structures, and exposure to strong winds or waves require careful engineering solutions and environmental assessments. Addressing these challenges through advanced modular designs, corrosion resistant materials, and smart monitoring systems is essential for large scale adoption. Recent pilot and commercial projects in countries such as China, India, Japan, and Singapore demonstrate the growing technical and economic viability of FPV. These early successes highlight its potential to complement land-based renewable energy systems and play a pivotal role in accelerating global decarbonization. As innovation continues, integrating FPV with energy storage, smart grids, and hybrid systems could further enhance its scalability and contribution to sustainable development goals.

In conclusion, advancing renewable energy through floating solar technologies represents a transformative step toward addressing energy security, water conservation, and climate change mitigation. With continued research, policy support, and technological improvements, FPV has the potential to emerge as a cornerstone of future renewable energy infrastructure worldwide.

Keywords: Floating Solar Photovoltaic (FPV), Renewable Energy, Water Conservation, Hybrid Systems, Sustainable Development.

ICGICPMC's202509P08

Investigation on photoluminescence properties of $Pb_3Bi(PO_4)_3:Sm^{3+}$ phosphor for solid state lighting

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Abstract

The $Pb_3Bi(PO_4)_3:Sm^{3+}$ phosphors were synthesized by a combustion method and structural and photoluminescence properties were systematically investigated. The Pb3Bi(PO4)3:Sm3+ phosphor at 404 nm Stimulating resulted in intense emission bands at 563 and 599 nm. The excellent color purity characteristic of the synthesized phosphors was revealed by CIE chromaticity coordinates. The photoluminescence characteristics of Pb3Bi(PO4)3:Sm3+ phosphor as potential materials for n-UV based solid-state lighting.

Keywords: Lanthanide doped, Photoluminescence, Combustion method, Solid-state lighting, Phosphor.

ICGICPMC's202509P09

Photoluminescence study of $Na_3La(PO_4)_2:Dy^{3+}$ phosphor for near UV-based solid state lighting

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Abstract

A series of Na3La(PO4)2:Dy3+ phosphors successfully produced using a wet chemical technique. The photoluminescence excitation and emission spectra, as well as the concentration dependency of the phosphor's emission intensity, were examined. The Na3La(PO4)2:Dy3+ phosphor was efficiently excited at 352 nm, yielding PL (Photoluminescence) emission spectra were obtained at 480 nm and 574 nm. Concentration quenching occurred at a Dy3+ ion concentration of 0.5 mol%. The current study suggests that the Na3La(PO4)2:Dy3+ phosphors could be a promising near-UV based for solid state lightening application.

Keywords: Photoluminescence, Solid state lighting, XRD, Lanthanide doped, Phosphor

ICGICPMC's202509P10

Synthesis and Multifaceted Characterization of La^{3+}-Substituted NiCo Spinel Ferrite Nanoparticles for High-Frequency and Energy Storage Applications

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Abstract

Polycrystalline La^{3+}-substituted NiCo spinel ferrite nanoparticles were synthesized using an optimized sol-gel auto-combustion approach, enabling fine control of nanoscale features. X-ray diffraction (XRD) analysis demonstrated a consistent decrease in crystallite size from 39.76 nm (unsubstituted NiCo) to 23.73 nm (La-NiCo), as well as a reduction in lattice parameter from 8.3220 Å to 8.3084 Å, confirming effective incorporation of La^{3+} ions into the spinel lattice. Characterization by Fourier transform infrared (FTIR) and Raman spectroscopy further validated the structural integrity and revealed characteristic phonon modes of the spinel ferrite framework. Field emission scanning electron microscopy (FESEM) indicated a controlled nanoparticle morphology with an average grain size of approximately 94 nm. Magnetic measurements showed that La^{3+} substitution leads to reduced coercivity (from 855 Oe to 782 Oe) and saturation magnetization (from 59.81 emu/g to 49.92 emu/g), along with a decline in magnetic anisotropy constant and a squareness ratio (Mr/Ms) near 0.5, suggesting a pseudo-single-domain nature. Dielectric measurements revealed low losses at 1 MHz, making these materials promising for high-frequency filter and antenna applications. Enhanced dielectric losses also highlight their potential for use in next-generation energy storage devices, underscoring their value in advanced technological applications.

Keywords: NiCo Spinel ferrite, XRD, Raman, VSM

ICGICPMC's202509P11

Synthesis and Photoluminescence Properties of $Sr5(PO_4)_3$ F: Sm^{3+} Phosphors

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Abstract

Synthesis and Characterization of Sm^{3+} Activated $Sr_5(PO_4)_3F$ Halophosphate based phosphor. Samarium (Sm^{3+}) activated strontium fluoropatite ($Sr_5(PO_4)_3F$) phosphor powder were prepared by combustion synthesis and characterized by XRD and photoluminescence techniques. Under the Excitation around 405nm $Sr_5(PO_4)_3F$ Phosphor shows different emission peaks 602nm and 646nm transition around $^4G_{5/2} \rightarrow {}^6H_{7/2}$, $^4G_{5/2} \rightarrow {}^6H_{9/2}$ under orange-red emission by doped Sm^{3+}. $Sr_5(PO_4)_3F:Sm^{3+}$ halophosphate phosphor may be good candidate for white LED lighting application.

Keywords: Halophosohate Phosphor Combustion Photoluminescence XRD

ICGICPMC's202509P12

Different Properties of L- Leucine & L-Histidine Doped Ammonium Dihydrogen Phosphate Single Crystals

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Abstract

Single crystals of pure and L-Leucine & L- Histidine doped Ammonium Dihydrogen Phosphate (ADP) were grown from aqueous solutions, employing slow evaporation technique at room temperature. The grown crystals were subjected characterized by powder X-ray diffraction to analyze their structural parameters. Fourier transform infrared (FTIR) spectral analysis was performed to identify the presence of various functional groups in the crystals. The UV-Visible-NIR spectral analysis was carried out to confirm the improvement in the transparency of the ADP crystal on the addition of L-Leucine & L- Histidine. The studies performed have revealed the incorporation of L-Leucine & L- Histidine into the lattice of ADP crystal. EDAX And Micro hardness Study.

Keywords: ADP, L-Leucine & L- Histidine; Crystal growth; X-ray diffraction; Single crystal, UV, FTIR, EDAX, Micro Hardness.

ICGICPMC's202509P13

Comprehensive Investigation into the Role of L-Histidine as a Dopant in Ammonium Dihydrogen Phosphate Single Crystals

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Abstract

This study presents a comprehensive investigation into the growth, structural, and optical properties of L-histidine doped ammonium dihydrogen phosphate (ADP) single crystals. High-quality single crystals of pure ADP and ADP doped with varying concentrations of L-histidine were successfully grown from an aqueous solution using the slow solvent evaporation technique. The inclusion of the semi-organic amino acid dopant, L-histidine, aims to enhance the inherent nonlinear optical (NLO) and physiochemical properties of the inorganic ADP crystal, which is a known material for NLO applications.

Powder X-ray diffraction (XRD) analysis confirmed that all grown crystals possess the native tetragonal crystal structure, indicating that doping with L-histidine does not alter the fundamental crystalline system of ADP. However, subtle variations in lattice parameters and peak intensity suggest the successful incorporation of the dopant into the ADP crystal lattice. Fourier Transform Infrared (FTIR) spectroscopy further confirmed the presence of characteristic vibrational modes corresponding to L-histidine, alongside the functional groups of ADP. Shifts in peak positions observed in the doped crystals provide spectroscopic evidence of host-dopant interactions through hydrogen bonding.

Investigation into the optical properties revealed that L-histidine doping significantly improves the optical transparency of ADP crystals in the visible and near-UV regions. Ultraviolet-Visible (UV-Vis) spectral analysis showed an increase in transmission and a lower UV cut-off wavelength for the doped crystals compared to pure ADP, making them suitable for optoelectronic applications. The nonlinear optical efficiency, measured using the Kurtz-Perry powder technique, was found to be notably enhanced in the L-histidine doped crystals. Second Harmonic Generation (SHG) efficiency was observed to be greater than that of pure ADP, increasing with dopant concentration.

The findings collectively demonstrate that L-histidine acts as an effective dopant for tailoring the properties of ADP single crystals.

Keywords: ADP, L-Histidine, XRD,FTIR,UV-Vis, SHG.

ICGICPMC's202509P14

Structural and Photoluminescence Properties of Eu^{2+}-Activated $CaAl_2Si_2O_8$ Phosphors Synthesized by the Combustion Method

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Abstract

In this work, we report the synthesis of novel $CaAl_2Si_2O_8:Eu^{2+}$ phosphors with varying concentrations (x = 0.5, 0.7, 1.0, 1.3, and 1.5 mol%) prepared by a simple combustion method, and their photoluminescence characteristics were systematically investigated. The structural properties were confirmed by X-ray diffraction (XRD), which indicated the formation of a pure crystalline phase without secondary impurities. Rietveld refinement was performed to obtain detailed structural parameters of the host matrix. Fourier-transform infrared (FTIR) spectroscopy confirmed the presence of functional groups associated with the phosphor lattice. The optical band gap, estimated using UV–Visible diffuse reflectance spectroscopy, revealed that the host lattice is suitable for efficient luminescence. Photoluminescence (PL) spectra exhibited a broad emission band in the blue-to-green region, corresponding to the allowed $4f^6 5d^1 \rightarrow 4f^7$ electronic transitions of Eu^{2+} ions. The emission intensity was found to depend on dopant concentration, with the highest luminescence efficiency observed at 1.0 mol% Eu^{2+}. Scanning electron microscopy (SEM) analysis provided insights into the particle size and morphology, while energy-dispersive X-ray (EDX) analysis confirmed the presence of all constituent elements in significant proportions. These results demonstrate that $CaAl_2Si_2O_8:Eu^{2+}$ is a promising phosphor material for potential applications in white light-emitting diodes (w-LEDs) and display technologies.

ICGICPMC's202509P15

"Multicolor Emission from Eu^{3+}, Tb^{3+}, Yb^{3+}, and Dy^{3+} Doped Nanomaterials: From Fundamental Photophysics to Applications"

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Abstract

Lanthanide-doped nanomaterials, particularly Eu^{3+}, Tb^{3+}, Yb^{3+}, and Dy^{3+} systems, exhibit multicolor emissions across the visible and near-infrared spectrum. Their sharp emission bands, long lifetimes, and tunable optical properties make them promising for applications in bioimaging, sensing, anti-counterfeiting, and solid-state lighting. Advances in host–dopant engineering and core–shell architectures continue to expand their multifunctional potential, bridging fundamental photophysics with real-world technologies.

Keywords:- Lanthanide-doped nanomaterials,Visible and near-infrared (NIR) luminescence and Multicolor emission

ICGICPMC's202509P16

Improve photocatalytic degradation of Indigo carmine dye using electrospun silver doped titanium dioxide nanofibers composite with polyaniline (PANI)

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Abstract

To enhance the photocatalytic properties of electrospun titanium dioxide nanofibers (TiO2 NF) by doped with silver (Ag-TiO2 NF) and composite with polyaniline (Ag-TiO2/PANI) are synthesized by electrospinning and in situ polymerization of aniline monomer at room temperature. As synthesized nanofibers and composites are further characterized by different techniques such as X-Ray diffraction (XRD), Scanning electron microscopy (SEM), X-ray Energy dispersive spectroscopy (EDAX), Fourier transform infrared spectroscopy (FTIR), and photocatalytic studies were carried out by Photo-reactor and absorption of Indigo carmine dye are measured by using UV-VIS spectrophotometer. Band gap of prepared nanofibers using kubelka-munk ananlysis are 3.32 eV, the highest degradation efficiency by Ag-TiO2/PANI are found 92.27% compared to Ag-TiO2 90.36% and pure TiO2 85.12% after 120 minute light irradiation of Indigo carmine dye. This work can provide the synthesis technique to enhance the photocatalytic activity of titanium dioxide NF by doping with transition metal and composites with conducting polymers.

ICGICPMC's202509P17

Dielectric Study of Aqueous Amides using Time Domain Reflectometry

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Abstract

Complex permittivity spectra of aqueous amides in the frequency range from 10 MHz to 30 GHz at various concentrations and temperatures have been determined using time domain reflectometry technique. The study focused aqueous amides due to their relevance in biological and chemical systems. Measurements were conducted at discrete temperatures to evaluate the temperature dependence of dielectric parameters including static dielectric constant (ε), dielectric relaxation time (τ), high-frequency limiting permittivity (ε∞), Kirkwood correlation factor have been determined.

Keywords: Dielectric spectroscopy; Time Domain Reflectometry (TDR); Aqueous amides;

The frequency-dependent dielectric spectra revealed distinct relaxation processes attributed to dipole reorientation of the amide molecules and the perturbation of the hydrogen-bonding network in water. Increasing temperature resulted in a systematic decrease in relaxation time and dielectric strength, consistent with enhanced molecular mobility and reduced hydrogen bonding. These findings provide insight into the solute–solvent interactions and dynamic behaviour of aqueous amide systems and contribute to a deeper understanding of hydrogen-bond-mediated dynamics in polar solvents at microwave and millimetre-wave frequencies. Frequency-dependent dielectric parameters such as the real (ε′) and imaginary (ε″) parts of the complex permittivity were measured. The data revealed distinct relaxation processes associated with dipole-dipole interactions and specific hydrogen bonding patterns. Analysis of the relaxation times—τ(1) from the Higasi method and τ(2) from group rotation dynamics—highlighted the influence of steric hindrance and hydrogen bonding strength. The formation of stable 1:1 molecular complexes and associated charge transfer between phenolic hydroxyl and amide carbonyl groups were confirmed by the observed maxima in relaxation time and molar free energy of activation. These findings contribute significantly to understanding the molecular interaction dynamics and solvation behavior in aqueous amide systems under high-frequency electric fields.

ICGICPMC's202509P18

"Synthesis and PL Properties of Highly Efficient and Thermally Stable $LaB_3O_6:Eu^{3+}$ Phosphors for UV-Excited Solid State Lighting"

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Abstract

The phosphor converted w-LEDs gain crucial attention in the field of solid state lighting (SSL) for generation of illumination owing to their numerous meritorious advantages such as superior life time, excellent efficiency, compactness, reliability and power saving consumption as well as environmental friendly. Therefore, the attempt was made to developed thermally stable phosphor materials composed of chromatic stability, optimum CRI and low correlated color temperature. A series of LaB3O6:Eu3+ phosphors were prepared using a simple, cheap and less time consuming combustion method. The PLE spectra of LaB3O6:Eu3+ monitored at excitation wavelength of 395 nm exhibits the emission centered at 594 nm (5D0→7F1) and 614 nm (5D0→7F2). The optical dopants concentration for the Eu3+ ions was optimized to 1 mol%, after which concentration quenching occurred. The color coordinate analysis indicates that Eu3+ doped LaB3O6 phosphors may have potential candidate for white light emitting diodes (wLED).

Keywords: Phosphor; europium rare earth ions; combustion method; photoluminescence; w-LED.

ICGICPMC's202509P19

Luminescence Properties of Eu^{3+} Doped Calciaum Aluminiumm Phosphate Nanophosphors

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Abstract

Calcium aluminium phosphate doped with varying Eu3+ concentrations (0.05 %, 0.15 %, 0.25 %, 0.5 %, 2%, 7 % molar concentrations) nanophosphor were synthesised using an energy efficient and eco-friendly co-precipitation method. The formation of nanophosphor was confirmed by X-ray diffraction (XRD) analysis, which revealed rhombohedral crystalline phase. The synthesised nanophosphor was analysed using SEM and EDS mapping to examine their morphological features and elemental composition respectively. The photoluminescence (PL) spectra exhibited a prominent emission peak at 613 nm, which corresponds to the $^5D_0 \rightarrow {}^7F_2$ transition of Eu^{3+} ions. The maximum luminescence emission intensity was achieved at Eu^{3+} concentration of 7 mol% in the host matrix. The strong red–orange emission observed under near-UV/ blue excitation suggests the potential application of this phosphor in red-emitting light-emitting devices.

Keywords: Co- precipitation synthesis, photoluminescence, X-ray, Eu^{3+}, phosphate, UV.

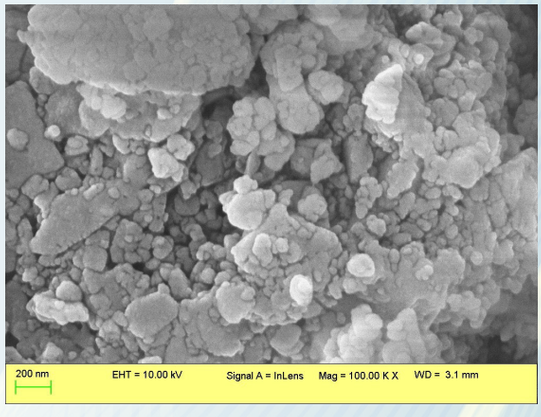

Figure 1: Surface morphology of Calcium aluminium phosphate nanophosphor

ICGICPMC's202509P20

Photoluminescence properties of K2Al2B2O7:Dy3+ phosphor prepared by combustion method

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Abstract

In the present work we have report the photoluminescent properties of K2Al2B2O7:Dy3+ phosphor prepared by combustion method using urea as a fuel. Prepared phosphor shows several excitation peaks located in between 280nm to 400 nm wavelength region with strongestexcitation peak observed at 352 nm. Upon excitation at 352 nm ,K2Al2B2O7:Dy3+phosphor shows blue emission at 482 nm and yellow emission at 573 nm. Concentration quenching is observed at 1 mole %. Excitation peak shows the prepared phosphor might have possible application in solid state lighting applications.

Keywords: Phosphor, Borate, Combustion method, Solid state lighting

ICGICPMC's202509P21

Structural, morphological and infra-red study of Mg-Ni substituted Co-ferrite nanoparticles

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Abstract

The effect of simultaneous doping of divalent Mg^{2+} and Ni^{2+} ions on structural morphological and optical properties of cobalt ferrite has been investigated. Samples with composition of $Co1-_xNi_{0.5x}Mg_{0.5x}Fe_2O_4$ (x = 0, 0.1, 0.2, 0.3, 0.4, 0.5) were synthesized by using the spontaneous sol-gel auto-combustion technique. Structural analysis of doped and pure sample has been done using X- ray spectrometer and reveals the well resolved indexed peaks indicating higher crystallinity and polycrystalline state of the prepared samples. The lattice constant (a) along with Hopping lengths LA and LB for all the samples was calculated using the prominent (311) peak and it decreases first up to concentration x = 0.2 and then slightly increases with the Mg^{2+}-Ni^{2+} substitution. Crystalline size (D) of all sample lies in the nano particle regime and increases from 21.41 nm to 41.74 nm with the substitution of Mg-Ni content. Dislocation density decreases with increasing Mg-Ni content, with improved crystallinity. Decrease in X-Ray density and bulk density with increased porosity of prepared samples was found with increasing concentration of Mg-Ni. Larger particle sizes and distinct agglomeration behavior shown by the SEM micrographs analysis and revealed the same quasi-spherical morphology, which is characteristic of ferrites made by the sol-gel technique. Grain size obtained through TEM study are pointedly comparable with the crystallite size obtained by XRD analysis and shows agglomerated nature of the synthesized nanoferrites. EDX endorse the presence of various compositional ratios of Ni, Mg, Co, Fe and O ions with a proportionate percentage verifying the desired stoichiometric composition. FTIR absorption bands of $Co1-_xNi_{0.5x}Mg_{0.5x}Fe_2O_4$ ferrite systems, which were recorded at room temperature in the wavenumber range of 400 - 4000 cm-1 interprets the appearance of two characteristic absorption frequency bands v_1 and v_2 which confirms the formation of spinel structure.

Keywords: Cobalt spinel ferrites, $Co1-_xNi_{0.5x}Mg_{0.5x}Fe_2O_4$, FTIR

ICGICPMC's202509P22

Sustainable Libraries: Integrating Green Practices for a Greener Future

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Abstract

Libraries have always been places where people could learn and share ideas, keeping knowledge alive and making sure everyone could get to it. In the twenty-first century, though, their job has grown to include one of the most important problems facing humanity: keeping the environment healthy. The idea of a "sustainable library" or "green library" shows how these places can use eco-friendly practices, run their businesses in a way that is good for the environment, and offer services that are good for the community while still being places where people can learn and get involved.

This paper examines the increasing significance of sustainability in library practice and evaluates the integration of green initiatives across various dimensions, including architecture, operations, information services, and community outreach. It looks at case studies and literature from around the world to find out what the best practices are, such as designing buildings that use less energy and using renewable energy sources. It also looks at how to promote digital collections that cut down on the need for paper. The study also looks at ways to cut down on waste, recycling programs, sustainable procurement, and new user-centered services that are good for the environment.

The paper also uses examples from both developed and developing areas to show how different regions have adopted green practices. Libraries in the US and Europe have led the way in eco-certified infrastructure and policy-driven programs. Libraries in countries like India, on the other hand, are trying out low-cost, flexible models of sustainability even though they face financial and policy problems. By comparing these situations, the paper shows how libraries can be agents of change by not only changing how they do things inside, but also by teaching and influencing their communities to take care of the environment.

The analysis reveals obstacles including insufficient funding, unawareness, technological limitations, and inadequate policy frameworks, while also proposing actionable solutions to address these issues. In the end, this paper says that libraries that are sustainable are not a luxury but a need. By making sustainability a part of their mission, libraries show that they are proactive leaders in the global effort to make communities more environmentally friendly and stronger for future generations.

Keywords: Sustainable library, Green library, Digital collections, Sustainable procurement, Green Practices, Greener Future.

ICGICPMC's202509P23

Impact of annealing temperature onto Cobalt Oxide (Co_3O_4) towards supercapacitor application

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Abstract

The Electrochemical properties and limits of the supercapacitor are intrinsically linked to design and physiochemical characteristics of electrochemical material. Cobalt oxide (Co3O4) being a metal oxide has multiple oxidation states and shows excellent redox efficiency ; Despite excellent Electrochemical performance cobalt oxide lacks sufficient electrical conductivity and structural stability.

In our work we have prepared nanostructured Cobalt oxide (Co3O4) using Hydrothermal Technique , further sample was air annealed at different temperature to study the effects of annealing over structural and electrochemical performance of prepared electrode. X – ray diffraction and electron microscopy revealed that cryastillinity as well as particle size improved with annealing effects. The electrode material annealed at 450 0 C delivered highest specific capacitance (Csp) of 726 F/g at current density 5 mA/cm2 , this enhanced specific capacitance can be attributed to fact that annealing improved the particle ,that further improved diffusion of charges .

Presented study highlights the pivotal role of annealing in modifying the crystallinity and electrochemical behavior metal oxides such as Co3O4 ; This new approach shall open new window for novel electrodes to be used in supercapacitor application.

Keywords: Co3O4 , Supercapacitors , Nanoparticles , Air Annealing , Hydrothermal

ICGICPMC's202509P024

Substitution of Co2+ ions in Magnesium spinel ferrites (CoxMg1-xFe2O4) is Suitable for Biomedical applications

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Abstract

Sol-gel auto combustion technique was employed to produce cobalt-substituted magnesium spinel ferrites CoxMg1-xFe2O4 powders (x=0.25, 0.3). X-ray diffraction (XRD) was used to examine the production of single-phase cubic spinel. The lattice parameter (a) determined from the cation distribution of samples exhibits a minor variance between Experimental (8.3669 Å & 8.3823 Å) and Theoretical (8.4028 Å & 8.3950 Å). The sample's crystallite size (D) (24.88 & 20.41 nm) may be obtained from the FWHM of the (311) crystallite. The size of the crystallite is affected by strain and dislocation density. It is due to the difference in ionic radii Co2+ (0.74Å) and Mg2+ (0.72Å) ions. The concentration of cobalt increases the magnetic characteristics, such as magneto crystalline anisotropy and saturation magnetization Ms (26.375 & 28.153 emu/g), remnant magnetization Mr (7.7362 & 8.7311 emu/g), and coercivity Hc (397.98 & 534.79 Oe), which were taken from the hysteresis loop. The sample's SQR ratio of 0.2933 and 0.3101 confirms the creation of a single domain, making it suitable for use in biomedical applications.

Keywords:- Sol-gel method, XRD, VSM

ICGICPMC's202509P025

Photoluminescence of Ce^{3+} in double bromide host

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Abstract

There has been a revived interest in Ce3+ activated halide phosphors due to applications as scintillation detectors, especially for positron emission tomography. Ce3+ exhibits intense emission due to allowed electric dipole transitions corresponding to transitions from levels of 5d1 configuration to 2Fj states of 4f1 configuration with fast decay time of the order of several nanoseconds. In the last few years, several inorganic scintillator materials based on Ce3+ have emerged that present a high light yield, a fast decay time, and a good energy resolution. The possibility to discriminate between gamma rays with slightly different energies by means of a scintillation detector is of great importance. The 5d-level spectroscopy of Ce3+ is very simple. In the excited state, the 4f-shell is empty and there is only one single 5d-electron interacting with the crystalline environment. Most commonly observed emission is characteristic of 5d-4f transitions which are parity and spin-allowed so that PL intensities are appreciable and lifetimes of the fluorescence are in the range of 10 – 60 ns. Ce3+ doped phosphors are thus useful where rapid decay times are required e.g. in time-of-flight camera and scintillators. Ce3+ emission has been studied in a large number of hosts. Amongst A2REX5, where A is alkali, RE is rare earth and X stands for halogen ion, early studies correspond to scintillation measurements on K2LaCl5:Ce3+ by van Spijker et al. van Loef et al described spectroscopic properties of K2LaCl5:Ce3+. Scintillation properties of Ce3+ activated K2LaX5 have also been reported by van Loef et al and Roy et al. Roy et al have also recently reported K2CeBr5 and Cs2CeBr5 scintillators. These systems are quite interesting compared to Ce3+ doped LaBr3. For all the K2LaX5 compounds, the light yield increases and the energy resolution (FWHM) improves with increasing Ce3+ doping. Another important application for K2LaX5 compounds is mid-IR lasers. Rare-earth-doped chloride crystals offer a broad IR window and slow rate of multiphonon quenching of activator luminescence, which makes them candidate materials for mid-IR lasers. In search of mid-IR laser materials, chloride crystals with high capacity for accommodating other rare earth ions are of special interest. However, there is not much information available on PL of Ce3+ in K2GdBr5 hosts. It was thus decided to study Ce3+ luminescence in this host. K2GdBr5 doped with different concentrations of Ce3+ ion were prepared by simple Wet Chemical Method and photoluminescence was studied. In these hosts, Ce3+ ion was found to be an efficient luminescence centre emitting in near UV region 360-400 nm. The results are presented and discussed in this paper.

Keywords: Ce3+, Photoluminescence (PL), UV, Excitation, Emission, Scintillation, 5-d spectroscopy.

TECHNICAL SESSION IV

MATHEMATICAL SCIENCES

ICGICPMC's202509M01

Entropy analysis in a Non-Newtonian Fluid Flow Through a Microchannel with Electromagnetic and Pollutant Effects

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Abstract

This study presents an in-depth analysis of the flow and thermodynamic behaviour of Casson couple stress fluid in a vertical microchannel under the combined influence of Hall current, uniform heat source/ sink, and pollutant discharge, subject to convective boundary conditions. The governing equations are transformed using similarity variables and solved numerically via the shooting technique coupled with the Runge-Kutta-Fehlberg (4,5th) scheme. The originality of this work lies in the simultaneous consideration of non-Newtonian rheology, electromagnetic effects, variable transport properties, and pollutant dynamics, a combination rarely addressed in microfluidic studies. The thermal field demonstrates a direct sensitivity to heat generation, where the temperature rises with increasing heat source strength.. Entropy generation responds dually to Casson parameter, indicating the sensitive interplay of flow, mass, and thermal transport mechanisms. The Bejan number profile illustrates spatial variations in the relative contributions of heat transfer and fluid friction irrversibilities under the impact of heat source, parameters. These findings provide a novel framework for the design and optimization of microchannel systems aimed at reducing energy dissipation, improving thermal efficiency, and mitigating pollutant dispersion. Potential applications span biomedical devices, sustainable chemical processing, and energy-efficient thermal management systems, demonstrating the broader role of fluid mechanics in advancing green technologies.

Keywords: Casson fluid, Convective boundary condition, External pollutant source constraint, irreversibility generation and Bejan number.

ICGICPMC's202509M02

Exploring Eulerian and Hamiltonian Graphs: A Study on Connectivity and Optimization

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Abstract

This study examines Eulerian and Hamiltonian graphs with emphasis on their fundamental definitions, structural properties, and algorithmic relevance. An Eulerian graph is identified by the existence of a closed trail that includes every edge exactly once, a feature valuable in applications such as circuit tracing, network flow, and routing problems. Hamiltonian graphs, in contrast, are defined through cycles that pass through each vertex once, forming the basis of optimization tasks like scheduling, logistics planning, and pathfinding challenges. The paper reviews algorithms developed to detect Eulerian and Hamiltonian paths and cycles, evaluating their efficiency and computational performance. By connecting classical graph theory with practical problem-solving, this work highlights the continuing significance of these graph structures in modern applications ranging from transportation to communication systems.

Keywords: Eulerian Graphs, Hamiltonian Graphs, Graph Theory, Algorithms, Transportation Planning, Network Analysis.

ICGICPMC's202509M03

Mathematical Frameworks for Uncertainty Quantification in Multiscale Digital Twin Systems: A Comprehensive Review of Methods, Applications, and Future Directions

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Abstract

Digital twin technology represents a paradigmatic shift in computational modeling, enabling bidirectional coupling between physical systems and virtual counterparts through continuous data exchange and predictive analytics. However, widespread adoption in critical applications remains limited by fundamental gaps in mathematical frameworks for uncertainty quantification, particularly across multiscale systems where phenomena span multiple temporal and spatial scales.

This comprehensive review systematically examines mathematical approaches for uncertainty quantification in multiscale digital twin systems, addressing critical research gaps identified by recent foundational studies. Through systematic analysis of 180+ peer-reviewed publications spanning 2019-2025, this study provides the first comprehensive synthesis of mathematical methodologies, computational frameworks, and practical implementations for uncertainty propagation in coupled physical-virtual systems.

The review employs a structured taxonomy categorizing uncertainty quantification approaches into four mathematical frameworks: (1) stochastic differential equation methods for continuous uncertainty propagation, (2) Bayesian inference techniques for model calibration under uncertainty, (3) polynomial chaos expansion and spectral methods for high-dimensional uncertainty spaces, and (4) machine learning-augmented approaches for hybrid uncertainty quantification in data-sparse environments. Each framework is evaluated regarding mathematical rigor, computational scalability, and practical applicability across application domains.

Key findings reveal significant methodological fragmentation, with aerospace, healthcare, and manufacturing industries developing domain-specific approaches lacking mathematical universality. Three fundamental challenges limit digital twin reliability: uncertainty propagation across disparate temporal scales without statistical inconsistency, real-time model validation under streaming data conditions, and optimal sensor fusion from heterogeneous networks with varying measurement uncertainties.

The analysis identifies promising convergence toward hybrid frameworks combining physics-based modeling with data-driven uncertainty quantification, particularly through variational inference integration with multiscale finite element approaches. Critical gaps persist in theoretical foundations for uncertainty bounds in coupled multiphysics systems and computational methods maintaining mathematical guarantees in real-time applications.

This review contributes by establishing the first systematic mathematical foundation for multiscale uncertainty quantification in digital twins, identifying critical research priorities, and proposing a unified framework for reliable digital twin systems supporting critical decision-making applications.

Keywords: Digital twins, uncertainty quantification, multiscale modeling, mathematical frameworks, stochastic systems, Bayesian inference, computational mathematics, cyber-physical systems.

ICGICPMC's202509M04

Formulation of Flows of Viscoelastic Fluid in Tubes

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Abstract

The expansion of a needle in a vertical plane is the mechanism that gives rise to the development of a flow. In order to turn leading partial differential equations, such as those requiring the conservation of energy, mass, and momentum, into the form of ordinary differential equations, dimensionless transformations are utilized. This allows for the successful conversion. Finding solutions to newly formed equations and boundary limits may be accomplished with the help of the Bvp4c function, mass, flow, and heat transfer characteristics are all influenced by the thermo-physical embedded components such as the magnetic parameter, variable thickness parameter, second-grade fluid parameter, small parameter, variable diffusivity parameter, and Prandtl number. Other embedded elements include the small which can be found in the MATLAB toolbox. In addition, graphical assessments of the concentration distribution, fluid velocity distribution, and energy distribution are done on the solutions that have been found. The parameter. In addition to these factors, there are others such as the tiny parameter and the variable diffusivity parameter.

Keywords: fluid flow, MATLAB, Mass

ICGICPMC's202509M05

Hygrothermal large deflection analysis of a functionally graded cylinder with radiation

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Abstract

Berger's approximation approach is used in this study to offer analytical solutions for hygrothermal large deflection in a functionally graded hollow nano-cylinder with radiation-type boundary conditions. It is believed that an exponential law distribution with non-homogeneity indices governs the radial variation of the material characteristics. The transient Fickian moisture diffusion and Fourier heat conduction equations are solved to get the linked governing equations for temperature distributions and moisture concentration with power law dependency on the radial coordinate. The closed-form solution for temperature and moisture distribution in the Laplace domain is derived using unconventional integral transforms that are suitable for radiation-type boundary conditions and de-coupling procedures. The numerical inversion method of Durbin's Laplace transform is then used to determine the solution in the time domain. Lastly, numerical findings and discussions regarding the FGM hollow nano-cylinder's displacement, moisture distribution, temperature distribution, and large deflection have been reviewed and visually depicted. The numerical findings show how the behavior of one-dimensional piezoelectric media is affected by hygrothermal loading, medium geometry, non-homogeneity indices, an external magnetic field, and an elastic foundation. The impact of temperature-dependent material qualities on the electro-mechanical responses is also examined for a homogenous temperature rise. Finally, the findings are compared to those documented in the literature.

Keywords: FGM, hygrothermal field, nano-cylinder, exponential law, large deflection.

ICGICPMC's202509M06

Unified Thermoelastic Modeling of Micro-elongated Solids: A Review of Fractional and Nonlocal Frameworks

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Abstract

This review synthesizes recent advancements in the modeling of micro-elongated thermoelastic solids using fractional calculus and nonlocal elasticity. Traditional thermoelastic theories often fail to capture the intricate memory effects and long-range interactions inherent in microstructured materials. By integrating fractional derivatives—Caputo, Caputo–Fabrizio, and Atangana–Baleanu—with Eringen-type nonlocal elasticity, researchers have developed robust frameworks that enhance predictive accuracy for stress relaxation, wave propagation, and thermal damping. This paper explores the evolution of these models, their mathematical formulations, and their applications in porous media, geomechanics, and biomedical engineering. Benchmarking strategies and convergence analyses are also discussed to guide future research.

Keywords: Micro-elongated solids · Fractional calculus · Nonlocal elasticity · Thermoelasticity · Memory kernels · Dual-phase-lag · Eringen theory · Thermal wave propagation · Caputo derivative · Atangana–Baleanu kernel

ICGICPMC's202509M07

Mathematical Aspects of Mudra (Hand Gestures) in Psychoneurobics Techniques

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Abstract

Research in Mathematics in alternative medicine is being done to some extent but still more is required to be done. Psychoneurobics is an alternative medicinal therapy where we do physical exercises synchronized with psychological instructions to the neurons.

The aim of this research is to study the Mathematical aspects of Psychoneurobics and use of hand gestures along with some yogic exercises.

Remarkable research has already been done in the use of hand gestures in yogic exercises, various dance forms, in spiritual healing sector, and many more. One who knows its scientific use and its benefits is taking efforts to let others know and get benefited by this science because self-experience matters a lot in it.

Keywords: Mathematical aspects, *Psychoneurobics*

ICGICPMC's202509M08

RFID Authentication Protocols in Smart Health Care Systems

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Abstract

RFID has emerged as a transformative technology in smart healthcare systems, enabling efficient patient monitoring, medical asset tracking, and real-time data management. However, the open and wireless nature of RFID communication exposes sensitive medical information to diverse security threats such as eavesdropping, replay, cloning, and man-in-middle attacks. To address these vulnerabilities, robust authentication protocols have been developed, ranging from lightweight schemes suited for resource-constrained RFID tags to advanced cryptographic approaches leveraging Elliptic Curve Cryptography, pseudo-identity mechanisms, and blockchain integration. In healthcare environments, authentication protocols must not only ensure confidentiality, integrity, and privacy of patient data but also remain computationally efficient to meet real-time demands. This paper reviews existing RFID authentication protocols in healthcare, analysing their security features, performance trade-offs, and applicability to Internet of Things (IoT)-enabled medical ecosystems. It further highlights research gaps and emerging trends, paving the way for designing secure, scalable, and interoperable RFID-based healthcare systems.

Keywords: RFID authentication protocols, smart healthcare systems, data security, lightweight cryptography, patient privacy.

ICGICPMC's202509M09

Formulation of Flows of Viscoelastic Fluid in Tubes

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Abstract

The expansion of a needle in a vertical plane is the mechanism that gives rise to the development of a flow. In order to turn leading partial differential equations, such as those requiring the conservation of energy, mass, and momentum, into the form of ordinary differential equations, dimensionless transformations are utilized. This allows for the successful conversion. Finding solutions to newly formed equations and boundary limits may be accomplished with the help of the Bvp4c function, which can be found in the MATLAB toolbox. In addition, graphical assessments of the concentration distribution, fluid velocity distribution, and energy distribution are done on the solutions that have been found. The mass, flow, and heat transfer characteristics are all influenced by the thermo-physical embedded components such as the magnetic parameter, variable thickness parameter, second-grade fluid parameter, small parameter, variable diffusivity parameter, and Prandtl number. Other embedded elements include the small parameter. In addition to these factors, there are others such as the tiny parameter and the variable diffusivity parameter..

Keywords: fluid flow, MATLAB, Mass

ICGICPMC's202509M10

One-dimensional Sinusoidally microplastics transport in a Aquifer

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Abstract

The occurrence and transport of microplastics in groundwater systems have emerged as a critical concern for subsurface water quality. This study investigates the one-dimensional transport of microplastics in a porous aquifer medium under sinusoidal boundary conditions. A mathematical model is developed to simulate the migration pathways, incorporating advection, dispersion, and particle–matrix interactions. The sinusoidal input function is employed to represent fluctuating microplastic concentrations at the source boundary, reflecting realistic variations due to seasonal or episodic discharge events. Model simulations highlight the influence of dispersion coefficient, particle size, and input frequency on breakthrough behavior and spatial concentration profiles. Results reveal that higher dispersion values promote wider migration, while lower dispersion leads to localized accumulation zones. The sinusoidal forcing generates periodic concentration waves within the aquifer, whose amplitude and phase are strongly controlled by aquifer heterogeneity. These findings provide insights into the dynamic behavior of microplastic pollution in subsurface environments and offer a theoretical framework for groundwater contamination risk assessment.

Keywords: Microplastics; Groundwater pollution; Advection–dispersion equation; Sinusoidal boundary condition; Aquifer heterogeneity; Subsurface transport.

ICGICPMC's202509M11

Exponential Backordering Inventory Model Addressing Shortages in Finite Planning Horizons

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Abstract

This paper develops an exponential complete backordering model for inventory systems that incorporates shortages within a finite planning horizon and price-sensitive demand under linear trends. The model accounts for demand variability, back ordering costs, and the interaction between demand and price through exponential backordering functions. Iterative computations were carried out using MATHEMATICA 12, while Python-based tools generated graphs and heatmaps to illustrate results. The findings demonstrate a reduction in total variable cost by identifying the optimal replenishment and shortage periods. A numerical example highlights the model's effectiveness in optimizing inventory management, leading to fewer stockouts, better supplier–retailer coordination, and reduced costs. Sensitivity analysis further emphasizes the impact of key parameters. This study provides a robust framework for improving supply chain management in dynamic demand environments where price sensitivity and backordering play a critical role.

Keywords: Finite planning horizon, Exponential backordering, Shortages, Complete backorder, Price-sensitive demand.

ICGICPMC's202509M12

Study of the Universe within the Framework of f(R) and f(R,T) Gravity: Insights into Cosmic Acceleration and Structure Formation : A Review

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Abstract

Modified gravity frameworks such as f(R) and f(R,T) gravity have been intensively studied as alternatives to dark energy and for unifying cosmic history. In recent works, the theoretical structure of f(R,Matter) type models has been clarified, highlighting consistency conditions, non-minimal matter couplings, and links to quantum-gravity motivations. Observational analyses using DESI, BAO, CMB lensing and galaxy clustering now place tight bounds on popular f(R) models, such as Hu–Sawicki, by constraining deviations in structure growth and lensing signals. For f(R,T) theories, recent cosmological model-building efforts show they can reproduce accelerating expansion and phantom/quintom regimes, but perturbative stability and compatibility with a full matter-dominated era remain challenging. Comparative reviews that combine theoretical viability, background reconstruction, and observational tests suggest that only a narrow parameter region remains viable, and upcoming large-scale surveys will be pivotal for falsifying or validating them. This review synthesizes these developments, delineates the main constraints and pitfalls, and proposes promising directions for future investigation in modified-gravity cosmology.

Keywords: f(R) gravity; f(R,T) gravity; modified gravity; cosmology; observational constraints; stability; matter–geometry coupling

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Relativity in GPS and Modern Navigation Systems

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Abstract

Purpose

The Global Positioning System (GPS) has emerged as an indispensable tool for navigation, timing, and communication worldwide. The precision of GPS depends upon accurate synchronization of atomic clocks aboard satellites with those on Earth. However, relativistic effects from both special and general relativity cause systematic deviations in satellite clock rates, leading to significant positional errors if uncorrected. This study aims to analyze the relativistic influences affecting GPS satellite clocks and to highlight the correction methods that ensure the exceptional accuracy of the system.

Methods

The analysis examines the impact of special relativity (velocity-based time dilation), general relativity (gravitational frequency shifts), Earth's rotation (Sagnac effect), and orbital eccentricities (periodic effects) on GPS clock rates. Quantitative calculations are provided for the time dilation offsets based on orbital velocity and gravitational potential differences. The study also reviews correction mechanisms implemented in operational GPS—such as pre-launch frequency adjustments of satellite clocks, ephemeris-based real-time updates via navigation messages, and continuous ground-control monitoring.

Results

It is found that special relativity slows satellite clocks by approximately 7 microseconds per day due to orbital velocity, while general relativity accelerates them by about 46 microseconds per day because of the weaker gravitational field at orbital altitude. The net effect amounts to a daily gain of 38.5 microseconds, which would correspond to over 11 km of navigational error per day without correction. Additional phenomena, such as the Sagnac effect, contribute nanosecond-level discrepancies corresponding to meter-scale errors, while orbital eccentricity introduces periodic variations that can further affect timing precision. The implemented strategy of pre-launch frequency offsets (-4.465×10^{1}), coupled with broadcast correction parameters and ground-segment monitoring, effectively mitigates these relativistic deviations.

Implications

This research underscores that relativistic corrections are not minor refinements but foundational requirements for GPS functionality. By systematically incorporating corrections for special and general relativity, rotational effects, and orbital perturbations, GPS achieves the sub-meter accuracy upon which countless civil, scientific, and military applications depend. The system thus serves as a practical demonstration of Einstein's theories, illustrating relativity's role not only in theoretical physics but also in the reliable operation of critical technologies that underpin modern society.

Keywords: Global Positioning System (GPS), Satellite clocks, Relativistic effects, Time dilation, Gravitational frequency shift, Sagnac effect, Orbital eccentricity.

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Graph Theory: An advanced loom towards chemical claims

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Abstract

Chemistry of graph theories was acknowledged as the dynamic claim of Math concerning the chemical as well as physical properties. In this era, chemists deemed that graph theory was an authoritative tool to model molecules and also for crunching numerical data's. In the present Study, several topological indices were used to cram the physical properties of alkanes.

Keywords: Graph Theory, Topological Indices, Hosoya index, Harary index, Randic´ index, Wiener number, Balaban index.

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Online Gaming Affects Aggression in Teenager's

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Abstract

In recent years, online gaming becomes popular recreational activities all over the world. Online games are most popular amongst the teenagers for their entertainment. Numerous benefits are found during gaming such as problem solving capabilities, multiplayer gaming encourage collaboration, communication and team work. These virtual environment build social connection which can serves as an outlet for stress. In today's era, online gaming addiction have increased rapidly due to use of android mobiles, tablets, laptops. Teenager's addicted gaming habit interfere with their daily life. The prolong use of online/video games causes aggression and leads towards violence, real world social isolation, loss of interest in real world, decline in academic performance and even show sign of depressions. The adverse effect of online gaming addiction may be reduced. Teenagers fulfill their requirement through social responsibility like studying, spending time with family, going out with friends etc. will make greater positive impact than more negative effects of online gaming.

Keywords: online gaming, aggression, teenager's, mobiles.

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About the College

Gramgeeta Mahavidyalaya, Chimur, a Beacon of Rural Education and stands as a symbol of academic excellence and social commitment. Established by Our visionary Honorable Mr. Vijay N. Wadettiwar, Former Cabinet Minister and Founder President of Semana Vidya Va Vanvikas Prashikshan Mandal, Gadchiroli with the vision of providing quality education to rural and under privileged communities, the institution has been instrumental in shaping the future of thousands of students in the region. The college was founded on the principles inspired by the Rashtrasant Tukadoji Maharaj's book Gramgeeta, a movement emphasizing rural self-sufficiency, education, and empowerment. Since its inception, Gramgeeta Mahavidyalaya has worked to bridge the gap between urban and rural education, offering opportunities to students who might otherwise be deprived of access to higher learning. This proved to be a landmark in the development of education of this region. The institution offered three UG courses Art, Commerce and Science four PG courses. The main objective of the institution is to transform the students into well-meaning citizens through the three-fold system with curricular, co-curricular and extra-curricular programmes.

About the Conference

The International Conference on Green Innovations in Chemistry, Physics, Mathematics & Computer Science (ICGICPMCs-2025) aims to bring together researchers, academicians, industry experts, and students to share their latest findings, research results, and innovative ideas in the field of science and technology with a special focus on sustainable and eco-friendly practices. This platform fosters interdisciplinary collaborations for addressing global environmental challenges through scientific advancement.

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