THE 11th HSCA INTERNATIONAL CONFERENCE on MATERIALS AND BIOLOGICAL SCIENCES

November 16-17, 2024

GOVERNMENT COLLEGE BILASPUR
District Bilaspur, Himachal Pradesh-174 001

Organized by

Him Science Congress Association

Promoting Excellence in Sciences

HIM SCIENCE CONGRESS ASSOCIATION

in
Collaboration with

Estd. 1952

GOVERNMENT COLLEGE BILASPUR

ASIAN POLYMER ASSOCIATION

ZOOLOGICAL SURVEY OF INDIA

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THE 11th HSCA

INTERNATIONAL CONFERENCE

on

MATERIAL AND BIOLOGICAL

SCIENCES

AT GOVERNMENT COLLEGE

BILASPUR,

HIMACHAL PRADESH ON NOVEMBER

16-17, 2024

शिव प्रताप शुक्ल
राज्यपाल
हिमाचल प्रदेश
राज भवन, शिमला

Shiv Pratap Shukla
Governor
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Message

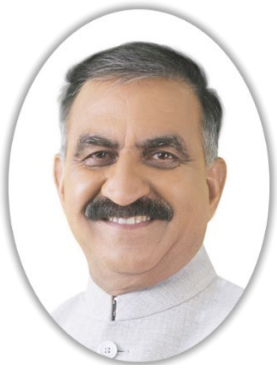
It gives me immense pleasure to know that the 11th International Conference on **'Materials and Biological Sciences'** is being organized by the **Him Science Congress Associationon** on November 16-17, 2024 at Government College, Bilaspur (Himachal Pradesh) in association with Zoological Survey of India, Kolkata, Government College, Bilaspur and Asian Polymer Association.

I am assured that the discussions made during this conference would enrich knowledge and will provide an excellent opportunity to the delegates/students, in identifying some newer trends in research areas of material and biological sciences to explore interdisciplinary research which will be a fruitful in near future.

I hope this conference will be remarkable effort to recognize the role of science and congratulate entire organizing team and appreciate their efforts in organizing this conference.

I extend my best wishes for the success of this Conference and publication of souvenir.

(Shiv Pratap Shukla)



सुखविन्द्र सिंह सुक्खू
SUKHVINDER SINGH SUKHU

हिमाचल प्रदेश सरकार

मुख्य मन्त्री
हिमाचल प्रदेश
CHIEF MINISTER
HIMACHAL PRADESH

Message

It gives me immense pleasure to know that Him Science Congress Association, Sardar Patel University, Mandi, Himachal Pradesh is organising its 11th International Conference on the theme 'Materials and Biological Sciences' in collaboration with Government College, Bilaspur and Asian Polymer Association and Zoological Survey of India on 16th and 17th November, 2024 at Bilaspur.

Over the past 12 years, the Him Science Congress Association has made remarkable contributions to the field by fostering scientific excellence and bringing together leaders from diverse disciplines. These efforts have greatly inspired young scholars in the region encouraging them to engage with cutting-edge science.

I am sure that this Conference will provide an apt platform for the delegates to exchange new research, ideas, share research insights and explore collaborative opportunities.

I wish the conference a grand success.

(Sukhvinder Singh Sukhu)

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ਪ੍ਰੋ: (ਡਾ.) ਆਦਰਸ਼ ਪਾਲ ਵਿਗ
ਚੇਅਰਮੈਨ

Prof. (Dr.) Adarsh Pal Vig
Chairman

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਰੋਕਥਾਮ ਬੋਰਡ
PUNJAB POLLUTION CONTROL BOARD (PPCB)
(Deptt. of Science, Technology & Environment, Govt. of Pb.)

D.O. No. 1039
Dated 5/11/2024

MESSAGE

A concept of "earth jurisprudence" was introduced, which is philosophy of law and human governance that is based on the idea that humans are only one part of a wider community of beings and that the welfare of each member of that community is dependent on the welfare of earth as a whole. This lies at the heart of our role as the multiple crisis we face globally are due to the dominant human activities which is continuously & systematically breaking the laws that governs life.

Green Revolution started in the year 1965 has undoubtedly transformed India to a food grain surplus country but has pushed the state of Punjab towards desertification. Intensified agriculture and indiscriminate use of chemical fertilizers, pesticides and insecticides not only lead to soil toxicity, polluted underground & surface waters and global warming but has also polluted food & fodder. It could lead to irreversible consequences to life of the people if the timely, adequate and sustainable measures are not taken up to mitigate the harm.

Since the 1980s, awareness of this environmental crisis has grown. All this drew attention to the fact that the human ecosystem is threatened by crucial imbalances in productivity and in the distribution of goods and services. The accelerating progress did not benefit the environment and affected environmental stewardship. The traditional business model portrayed environmental protection as a mere "public interest", however, these unconcerned actions have led to severe damage.

Over the past few years, the environmental aspect of Corporate Environment Responsibility (CER) has been in talks, as the stakeholders increasingly oblige companies to become more environmentally aware and socially responsible. Major steps towards the prevention and alleviation of the environmental damage have to be taken up by the private sector, and adopt an approach of co-responsibility. In order to extend the survivability and increase the profit rates companies have to adapt the environmental duty and accordingly include environmental cost in their balance-sheets.

There is a dire need for people across the world for leading a modest lifestyle and shun the use and throw culture of western world like use of Indian pottery instead of plastic based utensils, a washable cotton hanky instead of lot of tissue and not using banned packing material, disposables/Thermocoles for clean and sustainable lifestyle. Nothing is waste in the nature, everything is resource if we adopt reduce, reuse and recycle habits in our houses and offices.

With joint efforts towards the environment, humans could thwart their pollution and carbon footprint on the natural resources. So all of us have to join hand to share our responsibility towards the environment with the approach of 'me first' so as to restore the old glory of clean and green Punjab.

PPCB hope that the citizen of India will go beyond mere environmental compliances and share their responsibility towards protecting and preserving the environment for our future generations.

I hope that 11th International Conference on Materials and Biological Sciences being organized by HIM SCIENCE CONGRESS ASSOCIATION at Government College, Bilaspur, District Bilaspur, Himachal Pradesh will prove to be milestone in exchange of new research ideas, applications, research experiences, establish business or research relations in the field of environment.

Adarsh Pal Vig
Chairman

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डॉ. धृति बैनर्जी
निदेशक
Dr. Dhriti Banerjee
Director

Azadi Ka Amrit Mahotsav

भारत सरकार
भारतीय प्राणि सर्वेक्षण
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Government of India
Zoological Survey of India
Ministry of Environment, Forest and Climate Change

I am glad to know that **Him Science Congress Association** is organizing its 11th International Conference on 'Materials and Biological Sciences' at Government College, Bilaspur (Himachal Pradesh) during November 16-17, 2024. It is a matter of happiness that Zoological Survey of India is collaborating in this Conference along with Government College Bilaspur and Asian Polymer Association. Academic events such as conferences and seminars definitely serve the purpose of our pursuits for attaining excellence by exchanging scientific ideas as academic feast.

I hope that the presentations and discussions made during this conference will provide an excellent opportunity to the all delegates, especially the research scholars, in identifying some new research areas both in material and biological sciences to undertake interdisciplinary initiativesthat will be fruitful in their future research endeavors.

I congratulate whole HSCA team and appreciate their untiring efforts in organizing this conference.

My best wishes for the resounding success of Conference.

Dr. Dhriti Banerjee

Director, Zoological Survey of India

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Dated: 12.11.2024

Message from the President, Asian Polymer Association

Him Science Congress Association (HSCA) is organizing an International Conference on Materials and Biological Sciences on November 16-17, 2024 at Bilaspur, HP. The conference is a joint activity of HSCA and the Asian Polymer Association (APA) with a vision to have a broader participation of scientists across the different segments of science and technology. APA participation in the event would open up newer dimensions in the technological aspects of polymeric materials. I am sure that the conference will provide an unparalleled opportunity for in-depth engagement and knowledge exchange among global leaders in the various domains of science. It will serve as a pivotal forum for the discussion of cutting-edge developments and emerging trends within the international polymer community.

On behalf of APA, I extend a warm invitation to all participants and look forward to welcoming you to Bilaspur.

We are confident that this conference will not only be an intellectually enriching experience but also a visionary event that shapes the future of technological evolution across different fields.

Prof. Bhuvanesh Gupta

Government College Bilaspur

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(NAAC Accredited B Grade College)

Dear Delegates,

It gives me immense pleasure to welcome you all to the eleventh prestigious conference organized by the Him Science Congress Association (HSCA) in collaboration with Govt. College Bilaspur, Himachal Pradesh on "Materials and Biological Sciences". As the Principal of this institution, I extend my heartfelt wishes for the success of this event, which marks another milestone in HSCA's distinguished journey of "Promoting Excellence in Sciences." Over the past twelve years, HSCA has tirelessly worked to inspire and uplift young scholars, bringing together pioneers from diverse scientific fields. With its commendable efforts in rural outreach through skill development programs and its support for the Children's Science Congress, the association has been instrumental in cultivating a scientific culture across Himachal Pradesh. This conference is yet another testament to HSCA's unwavering commitment to fostering knowledge and innovation. Our college, with a rich legacy since its establishment in 1952, shares this vision. As one of the oldest and most prestigious institutions in the state, we have always strived for academic excellence and the holistic development of our students. It is a matter of great pride that we are hosting this important event, adding to the illustrious history of conferences organized by HSCA.

I am confident that this conference will provide valuable insights, inspire collaboration, and contribute meaningfully to the scientific community. My best wishes to the convenors, organizing secretaries, members of the organizing committee and all the participants for a fruitful and enriching experience.

Warm regards,
Dr. P.S. Kutwal
Principal
Govt. College Bilaspur

Welcome Message

I am truly honoured and delighted to take this opportunity to welcome you all to this Intentional conference on them Materials and Biological Sciences during 16-17 November 2024. The Conference intends to offer authentic and dependable contributions to the scientific community. The Conferences will provide perfect platform for global networking as it brings together renowned speakers and scientists.

The two-day conference program focuses on a broad range of issues and challenges in the field of sciences which will be weaved through the Keynotes Speakers, Plenary Speakers and Lecturers. More than 200 papers will be divided into different oral sessions and poster sessions.

To inspire and support meritorious students from economically weaker section of the society to pursue careers in science the Association is pleased to introduce two Science Chowfla Scholarships sponsored by Valley Agro Foods, Chamba starting from 2024 onwards.

I am delighted to inform that the Association has also introduced Innovation Awards for best working projects displayed by the school children during the Conference. Beside this six awards namely the Best Oral and Poster Presenter, respectively in each discipline followed by Young Scientist Awards given as recognition to the salient work of the selected researchers.

I believe that the success of the conference depends heavily on the people who have worked hard in planning and organizing the conference program. I hope that this conference will serve as an international platform for the exchange of knowledge and expertise in science researches and practices, at the same time explore the potential collaborations in future research.

I congratulate you for your commitment and active participation and wish you all the success.

Thank you for your attention.

Prof. (Dr.) Deepak Pathania

President, HSCA

PLANARY SESSIONS

THE 11th HSCA
INTERNATIONAL CONFERENCE
On
MATERIAL AND BIOLOGICAL SCIENCES AT GOVERNMENT COLLEGE BILASPUR, HIMACHAL PRADESH ON NOVEMBER 16-17, 2024

KEYNOTES SPEAKERS
INVITED TALK (IT)-01

Potential applications of a new one-dimensional copolymer containing 4-vinyldipicolinic acid

Abdel-wahab Mouhamad[a,b], Nadine Barroca-Aubry[b], Tamara Elzein[a], **Philippe Roger[b]**
[a]Lebanese Atomic Energy Commission, National Council for Scientific Research, CNRS-L, Beirut, Lebanon.
[b]Institut de Chimie Moléculaire et des Matériaux d'Orsay (ICMMO), UMR 8182, Bâtiment 420, Université Paris-Saclay, Orsay, France.
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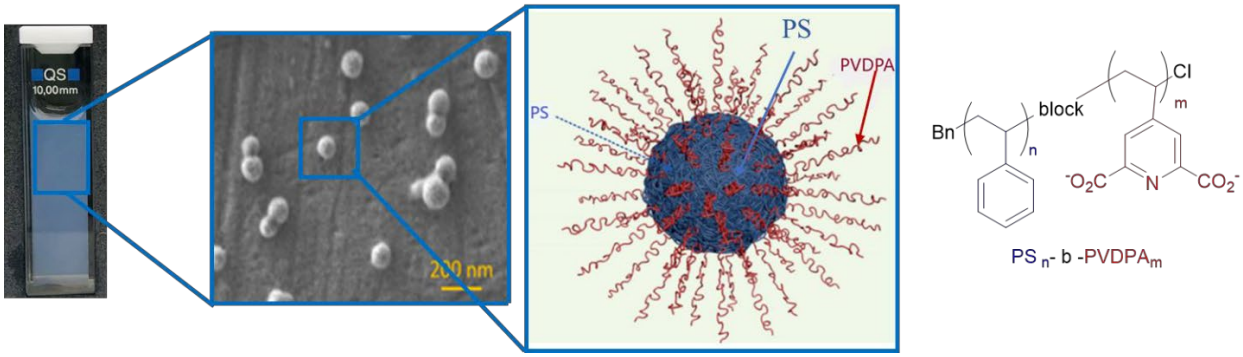
Abstract



In recent years, special attention has been dedicated to amphiphilic block copolymers, which are able to undergo spontaneous self-assembly in hydrophilic environments.[1] In this context, the aim of this work is the synthesis of a new copolymer (polystyrene-block-poly (4-vinyldipicolinic acid) PS-b-PVDPA in order to create stable nanoparticles in aqueous media. The prepared nanoparticles have been envisioned to purify water from radioactive metals as it has been previously demonstrated in recent work of our group. Indeed, PVDPA homopolymers showed excellent chelating properties for lanthanides and actinides and in particular an excellent capacity for uranium harvesting from seawater. Supplemental Activation Reducing Agent - Atom Transfer Radical Polymerization (SARA-ATRP) was used to synthesize different copolymer compositions. The self-assembly behaviors have been studied in aqueous solution at different pH and temperatures using Dynamic Light Scattering (DLS), Fluorimetry, Scanning Electron Microscopy and Transmission Electron Microscopy.

INVITED TALK (IT)-02

AIEgen-based Photodynamic Therapy

Bin Liu
Tan Chin Tuan Centennial Professor at the National University of Singapore (NUS)

Abstract

Recent years have witnessed the fast growth of fluorogens with aggregation-induced emission characteristics (AIEgens) in biomedical research. In this talk, I summarize our recent discovery that AIEgens with high brightness and efficient reactive oxygen species generation in the aggregate state offered great opportunities for image-guided cancer surgery and therapy. By combining the accurate prediction of material performance via first-principle calculations and Bayesian optimization-based active learning, a self-improving discovery system was realized for high-performance photosensitizers, which significantly accelerated our materials innovation for photodynamic therapy. Various strategies to overcome the intrinsic disadvantages of traditional photodynamic therapy will also be discussed.

INVITED TALK (IT)-03

Environmental Sustainability Through a Sustainable Way of Life

Professor Duni Chand, Department of Biotechnology,

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Summer Hill, Shimla-171 005.
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Abstract

Environmental sustainability refers to a holistic approach to living and operating in harmony with the nature by responsible use of resources to preserve the planet for future generations. It involves not only to practices that minimize harm to the environment but also embracing sustainable practices in our daily lives, businesses, and policies for ensuring a healthy planet and also recognizes the interconnectedness of human activities with the environment and seeks to ensure a balance that allows both present and future generations to thrive and also fostering a resilient and regenerative relationship with the planet, where economic, social, and environmental needs are met without compromising the ability of future generations to meet their own needs. In a sustainable way of life, individuals and communities strive to minimize their environmental impact by adopting practices such as reducing waste, conserving energy, and supporting local and organic food systems which includes embracing renewable energy sources, practicing mindful consumption, and choosing products and services that are ethically produced and environmentally friendly.

Environmental sustainability and food security are intricately linked, as the way we produce, distribute, and consume food has significant environmental implications. By integrating environmental sustainability principles into food production and distribution systems, we can enhance food security while safeguarding the health of our planet for future generations. Further, excessive exploitation, negligence, non-degradable nature, and physical and chemical properties of single use plastic waste has resulted in a massive pollution load into the environment. Consequently, plastic enters the food chain in the form of micro plastic and can cause serious health issues in aquatic animals and humans. Hence the need of the hour is to seek alternate for single use plastic such as bio plastic but environmental sustainability with respect to bio plastics also involves considering the entire lifecycle of these materials, from production to disposal, and assessing their environmental impacts compared to traditional plastics.

INVITED TALK (IT)-04

Biodiversity and mapping of butterflies (Lepidoptera) Indian NW Himalaya,

Pawan Kumar
ICFRE-Himalayan Forest Research Institute,
Conifer Campus, Shimla, H. P. 171009
Email: *pawan_hfri@rediffmail.com*

Abstract

The Western Himalayan Sub-Alpine Forests represent the frontline of the forested ecoregions in the western Himalayan region, standing against the treeless alpine meadows to the north. This ecoregion plays a critical ecological role as part of the Himalayan ecosystem, with interconnected processes that extend from the grasslands along the foothills to the high alpine meadows and boulder-strewn spree that lie above the tree line, known as the cold deserts. Butterflies [Rhopalocera] are particularly sensitive to climate and are important bio-indicators of climate change. The study on Butterfly biodiversity especially of the proposed study area is of great importance in terms of new developmental projects like Hydroelectric projects are being in consideration or are in process of commissioning which require EIA (environmental impact assessment) studies and preparation of EMPs (environmental management plan) before getting approval/clearance form Ministry of Environment and Forest, Govt. of India. These EIAs/EMPs have a biodiversity component in which Butterfly biodiversity has to be studied on priority basis as they are considered to be good bio-indicator. So this study will definitely be a baseline data/information for such EIAs/EMPs prepared in future for such developmental projects by any government or non- government organization.

The insect (including Lepidoptera) is identified based on the morphology, wing venation and genetalia, although different life stages also play important role in their identification. There are many moth species which are morphologically very similar and cannot be distinguished by normal eye but these can be different species or may even belong to separate genus. The insects offer the most diversified biological component of a forest ecosystem and have a great role in maintaining the cycling of nutrients, soil regeneration and protection, pollination of phaner-ogamic plants, honey production and natural regulation of pests. The present study will aim to identify the distribution patterns of butterflies and their food plant resources in the Western Himalayan Sub-Alpine Forest Ecosystems on a GIS platform and correlate their distribution with environmental parameters to study the impact of climate change

INVITED TALK (IT)-05

Nyctanthes arbor-tristis Mediated Synthesis of Copper Oxide Nanoparticles: A Sustainable route for Nanotechnology''

Jyoti Chaudhary
Associate professor, Department of Chemistry, M.L.S. University, Udaipur, Rajasthan
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Abstract

An ecofriendly and low-cost approach for producing copper oxide nanoparticles (CuO NPs) from the leaves of *Nyctanthes arbor-tristis* has been researched in order to promote sustainable nanotechnology in Dye degradation. In this study, we focused on the green synthesis of copper oxide nanoparticles using a plant extract from the *Nyctanthes arbor-tristis* plant (leaves). Several spectroscopic techniques, including UV-Vis, FTIR, SEM, TEM, and X-ray diffraction, can be used to analyze CuO NPs, which demonstrate the synthesis of the required copper oxide nanoparticles. UV–vis spectroscopy confirmed the presence of CuO NPs. Functional groups present in leaf extract and synthesized CuO NPs were identifying using FTIR spectrometry. TEM, XRD and SEM reveals Copper oxide nanoparticles with typical particle sizes ranging from 20 to 45 nm were crystalline and spherical respectively. The results showed that the phytochemicals present in plant extract were effective in reducing copper salts and producing stable copper oxide nanoparticles. Furthermore, the synthesized copper oxide nanoparticles exhibited significant antimicrobial activity against *E. coli, S. aureus* bacteria. The biogenic synthesis method eliminates harmful chemicals, making it suitable for environmental applications. This study demonstrates the potential of *Nyctanthes arbor-tristis* as a sustainable resource for nanoparticle synthesis.

INVITED TALK (IT)-06

Mite Pests of Agri-Horticultural Crops

Paramjit Kaur and Manmeet Brar Bhullar
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Abstract

Mites are among the most important arthropods, causing economic injury to majority of crops and as natural enemies used in biological control of insect and mite pests. Because of their minute size, they are comparatively less known than insects. Mites are covered under subclass Acari of class Arachnida and phylum Arthropoda. Mites are easily separable from insects by lack of antennae, mandibles and maxillae, and presence of four pairs of legs. The size of plant feeding mites ranges from 200µ to 600µ. Majority of the plant feeding mites belong to suborder Prostigmata. Mites of the families Tetranychidae (spider mites), Tenuipalpidae (false spider mites), Eriophyidae (gall/bud mites) and Tuckerellidae are exclusively phytophagous while a few species of Tarsonemidae (broad mites) are phytophagous. In agriculture, the problem of phytophagous mites became intense after the introduction and large-scale use of broad spectrum pesticides which on one hand effectively controlled the insect pests against which they were used and on the other hand also destroyed the natural enemies of mites resulting in their outbreaks and posing greater problem.

INVITED TALK (IT)-07

Biological Diversity: Issues and Strategies for their Conservation

P.C. Pathania
High Altitude Regional Centre, Zoological Survey of India,
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Abstract

The term “biodiversity” credited by Walter G. Rosen of the National Academy of Sciences in 1986. While planning for the National Forum on Biodiversity in Washington, DC, he used it as a contraction of "biological diversity" in internal paperwork and believe that this term would help the conservation cause for the people. It refers to the variety of living things on earth, which include genes, species, ecosystems and interactions between them. It is a key indicator of the health of an ecosystem which help the nature, humans need for living by food, water, medicine and shelter. Since 1908’s, biodiversity has become popular word and this has attracted the people with more attention and required more discussion in the recent past. The various issues were held in the four major earth summits held at Rio de Janeiro (1992), New York (1997), Johannesburg (2002) and Rio+20, Brazil (2012) on the green economy, and it resulted in the adoption of the Sustainable Development Goals (SDGs). These are an agreement that aims to end poverty, protect the planet, and ensure a good future for all living things. With experience, knowledge, sufferings and necessities, man has come to very well realize that the entire fabrics of life need to be conserved through sustainable development, which refers to meet the needs of present generation without compromising the ability of future generations to meet their own needs.

Today’s threat to different species (including man) and ecosystems are the greatest in the recorded history. All of them are being caused by human mismanagement of bioresources; often stimulated by misguided economic policies (McNeely et al., 1990). From conservation point of view, Man should treat himself a component of the overall biodiversity and respect each organism if conservation and sustainable development is our ultimate goal. Sustainability is not possible till inherent ability of an ecosystem to sustain itself to perpetuate by adopting an evolutionary system, which moves from cradle to cradle and not cradle to grave.

INVITED TALK (IT)-08

Impact of the Exotic Brown Trout on the Life History Traits of Endemic Snow Trout

Y.K. Rawal
Professor and Former Chairperson
Department of Zoology
Panjab University, Chandigarh

Abstract

The introduction of the exotic fish species has been happening since long and it is still continuing for a variety of reasons such as increasing commercial production; as biocontrol agents for aquatic plants and insect larvae; as sport fish for angling besides some are accidental introductions. The same has been continuing unabated without any check/monitoring the impact of these exotic introductions on the native fish fauna. The task of the monitoring in the aquatic systems is a difficult preposition compared to a terrestrial ecosystem for obvious reasons. The present paper is a step in the direction of monitoring of the aquatic ecosystems by studying the life history traits of the endemic snow trout under invasive pressure of the brown trout. The life history traits such as length-weight relationship, condition factor, gonado-somatic index, fecundity, egg diameter and length at maturity were studied for both snow trout and brown trout in allopatric and sympatric conditions and the results revealed an alteration in the life history traits of snow trout under invasive pressure.

INVITED TALK (IT)-09

Solution of Polynomial Equations through Vedic Mathematics Techniques

Dinesh Kumar Sharma
Department of Mathematics (SBAS)
Maharaja Agrasen University Baddi HP

Abstract

In this work the solutions of polynomial equations have been presented through Vedic Mathematics with help of Sutras of Vedic Mathematics. The linear equations, quadratic equations, cubic equations, biquadratic equations and system of equations were solved with the help of sixteen sutras of Vedic Mathematics. These sutras were nicely presented by father of Vedic Mathematics Bharati Krishna Tirtha Ji in his Diary 1951. Linear equations and system of equations have been solved through sutra **(आनुरुप्ये) शून्यमन्यत** and quadratic equations and cubic equations are solved by sutras of factors.

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ABSTRACTS DETAILS

BIOLOGICAL, ALLIED & MEDICAL SCIENCES

PAPER ID- 101

REPORT ON THE COLEOPTERA DIVERSITY (INSECTA: ARTHROPODA) FROM DHARAMPUR AND ADJOINING AREAS OF DISTRICT MANDI, HIMACHAL PRADESH

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Abstract

Insects are the tracheal arthropods (animal kingdom) with distinct head, thorax and abdomen. Head with a pair of antennae, thorax with three pair of legs, one or two pair of wings and tough shell-like outer covering. They live from steamy tropical jungles to cold polar regions or almost everywhere appeared on earth at least 400 million years ago. It is estimated by the Entomologists that the average number of insects for each square mile (2.6 square kilometers) of land equals to the total number of people on the earth. Under class Insecta, one of the largest insect order is Coleoptera and can be easily explored in almost every type of habitat including different water bodies. Coleoptera includes the insects commonly known as beetles with approximately 3,50,000 described species on global basis. During optimum conditions, their numbers increase very high and the economic importance of Coleopteran are very well known as most of them are phytophagous which are serious pests of our agricultural crops, plants, forest trees, stored grains. Some representatives of this order are beneficial also (as decomposers, biocontrol agents, incidental pollinators, environmental indicators etc.). Coleopterans adults are easily recognized by their hard forewings known as elytra and stout body architecture. They are poorly studied on Indian basis rather than the global taxonomic studies on the group, the same statement is true for the taxonomic studies on the Coleopteran fauna from the area under reference. In this connection, an attempt has been made to work on the Coleopteran diversity from the Dharampur and adjoining areas of the dist. Mandi of Himachal Pradesh.

The land of unexplored tourist destination, near Baba Balak Nath Mandir (Kamlah Fort) of district Mandi is located in the middle of Hill state Himachal Pradesh within an altitudinal rage of 1000-1500m ASL. During exploration to different localities of these areas, a total of One hundred and three specimens belonging to families i.e., Carabidae (Ground beetles/tiger bettles), Cerambicidae (Longhorned beetles), Chrysomelidae (Leaf beetles), Coccinelidae (Lady beetles), Hydrophilidae (Water Scavenger beetles), Meloidae (Blister beetles) and Scarabidae (Scrab beetles) of order Coleoptera have been collected and further processed for their taxonomic studies. The detail aspects on their geographical distribution, photographs of the species and their host ranges from various families will be discussed.

PAPER ID - 102

A PRELIMINARY REPORT ON DIVERSITY OF BUTTERFLY (LEPIDOPTERA) FROM MEDZIPHEMA AREA OF NAGALAND, INDIA

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Abstract

The various aspects on monitoring, conservation of biodiversity and sustainable development are being discussed at various fora, including various Earth Summits held at Rio-de Janeiro (1992), New York (1997), Johannesburg (2002) and again at Rio-de Janeiro (2012). Introduction of the term "biodiversity" and the first Earth Summit, one thing has clearly emerged that documentation of the biota be given more priority, particularly in the biodiversity rich biogeographical areas. This has led to the recognition of the "Science of Taxonomy" amongst various other biological disciplines. Lepidoptera (moths, butterflies and skippers) is the third largest order after Coleoptera and Hymenoptera in the class Insecta in the 30 insect orders. About 2,00,000 species of this order enlisted from global basis, out of these, only 15,000 are butterflies and remaining moths whose number is roughly equivalent to known flowering plant species. (Holloway et.al, 1992). A preliminary investigation on the diversity of butterflies was carried out at Medziphema, Nagaland. During different surveys-cum- collection tour to various localities of the areas a total of 102 specimens of different butterflies were collected from August, 2023 to August, 2024. These are belonging to ten species of eight genera under three families i.e., Nymphalidae, Papilionidae and Pieridae of order Lepidoptera. After examination it has been observed that the representation of species of family Nymphalidae was the most common viz. *Danaus chrysippus chrysippus* Linnaeus., *Junomia almana* Linnaeus, *Euploea core* Cramer, *Euploea mulciber* Cramer, *Moduza procris procris* Cramer and *Neptis mahendra* Moore in the area under reference. The details on their morphological characters, sitting posture in the fields, their distribution along with host plants etc will be discussed.

PAPER ID- 103

EVALUATION OF ANTIOXIDANT ACTIVITIES OF *VOLVARIELLA VOLVACEA* (BULL.) SINGER (PADDY STRAW MUSHROOM)

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Abstract

Volvariella volvacea is a nutrient rich tropical mushroom that has recently attracted attention of people due to its nutraceutical values. In the current study the acetone, aqueous and methanol extracts of fruiting bodies were evaluated for antioxidant property based on reducing power, radical (DPPH) scavenging activity and total phenolic contents. The superoxide dismutase activity (SOD), ascorbate peroxidase (APX) activity and non-protein thiol (NPT) contents of the fruiting bodies were also evaluated. Results showed reducing power 0.096 (acetone extract), 0.197 (aqueous extract) 0.335 (methanol extract). Radical scavenging activity (RSA) 77.618 % and IC 50 304.03 µg/ml in aqueous extract, 61.205% and IC 50 410.99 µg/ml in methanol extract, 13.970% and IC 50 1770.32 µg/ml in acetone extract. Total phenol content were found 1.612 µg GAE/mg DW in acetone extract, 2.045µg GAE/mg DW in aqueous extract and 1.928 µg GAE/mg DW in methanol extract. The fruiting bodies of the mushroom also showed superoxide dismutase activity (3.47 U/mg protein), ascorbate peroxidase activity (2.11µmoles /mg protein min -1) and Non-Protein Thiols (2.360 µ moles/g DW). The study revealed high antioxidant activities; hence the mushroom should surely be incorporated into our daily diets in order to improve the nutrition, health and the general well-being of the people and further investigated for their medicinal purposes.

PAPER ID- 104

BUTTERFLIES OF LADAKH: COMMUNITY ATTITUDES, CULTURAL VALUE, AND ECOSYSTEM SERVICES

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Abstract

This study is to investigates public perceptions of butterflies in Ladakh. While 73% of respondents had negative attitudes toward carnivores, only 10% expressed such views about butterflies. Despite this, 76% identified certain butterfly species as agricultural pests, posing significant threats to crops. Younger generations showed more positive attitudes toward butterflies, appreciating their aesthetic value. Butterflies were more abundant in agricultural landscapes, especially alfalfa fields and vegetable gardens, with species from the Lycaenidae, Pieridae, and Nymphalidae families frequently observed. In wild habitats, sightings were fewer but still diverse, with *Satyrinae* and *Polyommatinae* butterflies being most common. Butterflies hold cultural importance, particularly in Ladakh's Islamic and Buddhist traditions, where they symbolize beauty and nature. The presence of butterflies also supports ecotourism, though concerns over habitat degradation and smuggling were raised. Ecologically, butterflies act as pollinators, contribute to nutrient cycling, and serve as indicators of environmental health, emphasizing the need for conservation efforts in response to climate change and habitat loss.

PAPER ID- 105

High-Altitude Apollo Butterflies: Species Richness and Regional Distribution in The Indian Himalayas

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Abstract

Apollo butterflies (*Parnassius*) serve as key indicators of climate change impacts in high-altitude ecosystems across Europe, Central, and South Asia due to their sensitivity to environmental shifts. A review of over 150 sources revealed state wise confirmed species and 2041 occurrence records in the Indian Himalayas, identifying 39 synonymic species groups through recent taxonomic revisions. Field surveys in Ladakh highlighted significant populations of *Parnassius epaphus* Oberthür, 1879, *Parnassius hardwickii* Gray, 1831, and *Parnassius charltoniu* Gray, 1853. Peak abundances were recorded between 3500 to 5500 mASL. Ladakh shows the highest *Parnassius* species richness in India (16 species), followed by Himachal Pradesh (14 species) and Jammu and Kashmir (13 species). India also leads in Parnassius diversity in Asia with 17 species. The findings emphasize the Indian Himalayas as a biodiversity hotspot for Apollo butterflies and call for further taxonomic research to address classification complexities and improve species conservation efforts.

PAPER ID- 106

A PRELIMINARY CHECKLIST OF *RHOPALOCERA* (INSECTA: LEPIDOPTERA) FAUNA OF BANI WILDLIFE SANCTUARY, JAMMU AND KASHMIR, INDIA

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Abstract

Protecting the rich biodiversity of our wildlife sanctuaries is paramount for maintaining ecological balance. *Rhopalocera* diversity surveys were conducted in the newly established Bani Wildlife Sanctuary over two years, spanning from 2021 to 2023. This comprehensive study revealed a diverse butterfly fauna within the sanctuary, documenting a total of 90 butterfly species. Notably, 15 of these species are listed under Schedule I and Schedule II of the Wildlife Protection Act, 1972 (Amendment 2022). The butterflies were documented on 30 host plant families, with the most prevalent being Fabaceae (25 species, 27.8%) and Poaceae (19 species, 21.1%), followed by Malvaceae (9 species, 10%), Rutaceae (8 species, 8.9%), Acanthaceae (7 species, 7.8%), Rhamnaceae (6 species, 6.7%), Brassicaceae (5 species, 5.6%), Cannabaceae (5 species, 5.6%), and Apocynaceae (5 species, 5.6%). An additional 11 families hosted fewer than five butterfly species each. However, 50 of the recorded butterfly species within the sanctuary have no known host plants, indicating the need for further research on their ecological requirements. In addition to host plant data, the study incorporates a complete bibliographic reference representing previously published literature on the butterfly fauna of Jammu & Kashmir, enhancing the comprehensiveness of the checklist. This checklist provides a foundation for future conservation efforts and highlights the importance of the Bani Wildlife Sanctuary as a crucial habitat for butterfly conservation.

PAPER ID- 109

MICROBIAL PROFILING OF PUS SAMPLES FROM FACIAL ACNE AND EVALUATING THE EFFICACY OF ANTIBIOTICS AND PLANT-BASED EXTRACTS

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Abstract

Acne being a common skin condition globally affecting about 85% of teenagers, predominantly occurring during adolescence. Studies have found that acne typically harbours bacteria from genera such as *Staphylococcus*, *Propionibacterium*, *Micrococcus*, *Corynebacterium*, and *Streptococcus*. In the present study, 24 bacterial strains were isolated and identified as *Staphylococcus epidermidis* (18 isolates), *Staphylococcus aureus* (4 isolates), and *Micrococcus luteus* (2 isolates). The study revealed that the samples from more severe cases of acne had a predominant presence of *Staphylococcus aureus*. Antibiotics serve as an important standard therapeutic in acne treatment, but they exhibit broad-spectrum effects, potentially leading to multi-drug resistance. The current research revealed that *Staphylococcus aureus* is more responsive toward antibiotics than *Staphylococcus epidermidis*. Given the side effects of antibiotics, the study emphasizes the need for natural, safer, and more affordable alternatives. Traditionally, herbal and plant-based remedies have been used for treating acne. In this research, the minimum inhibitory concentration (MIC) of methanolic extracts from *Citrus sinensis* (orange peel) and *Polyalthia longifolia*, as well as aqueous extracts of *Morus nigra*, was tested against both isolated isolates and standard bacterial strains. The aqueous extract of *Morus nigra* leaf showed the most promising results, inhibiting both *S. aureus* and *M. luteus* at 2.5 mg/100µl. This study underscores the importance of exploring the microbial environment of acne and highlights the potential for developing novel, effective treatments using both antibiotics and plant-based compounds, particularly in addressing concerns over antibiotic resistance and side effects.

PAPER ID- 108

ISOLATION, CHARACTERIZATION AND ANTIMICROBIAL EFFICACY OF ENDOPHYTIC MICROORGANISMS FROM DIFFERENT MEDICINAL PLANTS OF HIMACHAL PRADESH AND UTTARAKHAND

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Abstract

Plant growth and its defence mechanism have been facilitated by endophytic microorganism, in symbiotic association with bacteria found in various plant sections. Secondary metabolites such as quinones, alkaloids, tannins, steroids, and terpenoids produce by plants possess antibacterial, anti-inflammatory, and anticancerous properties. In order to isolate the endophytic organisms, ten medicinal plants i.e., *Urtica dioica*, *Eupatorium adenophorum*, *Carica papaya*, *Thuja occidentalis*, and *Cinnamonum tamala* were obtained from different locations in Himachal Pradesh (HP) and Uttrakhand (UK). A total of 22 distinct endophytic microorganisms were recovered from leaves, stem, and root. *Arthrinium sp*. demonstrated the highest antioxidant activity, while *Alternaria sp*. displayed the lowest antioxidant activity. Based on qualitative tests, *Bipolaris sp*. isolated from *Thuja occidentalis* showed the maximum zone of inhibition in antibacterial activity, measuring 32mm against *Shigella flexneri*. Meanwhile, *Ulocladium sp*. and *Fusarium sp.* isolated from *Urtica dioica* (UK) and *Eupatorium adenophorum* (UK and HP) exhibited the minimum zone of inhibition, measuring 10mm against S. typhi and *P. aeruginosa* at a concentration of 100µl. MIC was also done to evaluate the microbial extract (ethyl acetate) efficacy against many harmful bacterial strains. In *Bacillus acidiceler* extract, the lowest dose needed to prevent pathogenic bacterial growth was 0.625mg/100µl. Although being preliminary data, the results suggest that endophytic organisms could be a valuable source of antioxidants and biocontrol agents. As a result, plants from Uttarakhand had higher antibacterial potential due to environmental differences such as soil composition, rainfall, microflora of plant soil and plant genotype.

PAPER ID- 110

In Vitro screening of Bioactive Endophytic microorganisms Isolated from Medicinal Flora of the Sub-Himalayan Region

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Abstract

The increasing threat of antibiotic resistance has created an urgent need for novel antimicrobial agents. Medicinal plants, known for their healing abilities, contains microorganisms making them an important bioactive compound. This study, focuses on theisolation and characterization of endophytes utilizing different medicinal herbs like Achyranthes bidentata, Asparagus racemosus, Centella asiatica, Withania somnifera, and Viola odorata, that are well known for their therapeutic efficacy. A total of fifteen endophytic microorganisms were isolated and identified, out of which some were bacterial (e.g., Pseudomonas sp., Bacillus sp., Aeromonas sp., Serratia sp., Micrococcus sp.) and some were fungal (e.g., Alternaria sp., Ulocladium sp., Fusarium sp.) species. These endophytic organisms were further screened for their antimicrobial, antioxidant, and plant growth-promoting activities. Among fungi, Ulocladium sp. from Withania somnifera exhibited maximum free radical scavenging activity of 83.04%, while Alternaria sp. showed the minimum of 77.32% free radical scavenging activity. In antifungal assays, Alternaria sp. And Fusarium sp. inhibited Aspergillus niger and Penicillium notatum, while Ulocladium sp. inhibited Rhizopus sp. In antibacterial tests, Ulocladium sp. from Withania somnifera showed the largest zone of inhibition (29mm), while Alternaria sp. showed the smallest (9mm). Minimum inhibitory concentration (MIC) assays revealed that the ethyl acetate extracts of the fungi effectively inhibited pathogenic bacteria, with MIC values as low as 2.5mg/100µl.These findings highlight the potential of endophytic microorganisms in drug discovery andbsustainable agriculture, offering promising leads for combating antibiotic-resistant pathogens.

PAPER ID- 111

A CASE STUDY OF HUMAN-WILD BOAR (*SUS SCROFA* L.) CONFLICT IN AGRICULTURAL CROP FIELD NEIGHBORING SUTLEJ CANAL, LUDHIANA, PUNJAB

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Abstract

The aim of present study was to generate information on existence of Wild boar (*Sus scrofa* L.) in agricultural crop fields adjacent to Sutlej canal, Ludhiana, Punjab. The Indian wild boar is a member of Phylum- Chordata, Class- Mammalia, Order- Artiodactyla, Family- Suidae,Genus- Sus and species- *S scrofa*. They are omnivore and live mostly nearby human habitation due to diverse food availability. Indian wild boar habitat preferences and interactions with its environment were studied to develop various management measures. Line transect and point count methods were used to study the population density of Indian wild boar through direct observations. In this survey, questionnaire based information was collected from farmers of village Bholewal Jadid of District Ludhiana in order to observe the pest problem of wild boar. During the study period i.e. January-March 2024, the presence of wild boar was confirmed near paddy fields through pug marks, faecal samples and direct observation in paddy crop fields. The percentage of occurrence of pug marks was 89% followed by faecal samples (75%) and direct observation (71%) in paddy crop fields.

PAPER ID- 112

PRELIMINARY STUDY ON THE PREVALENCE OF WILD BOAR (SUS SCROFA L.) AND ITS DAMAGE IN AGRICULTURAL ECOSYSTEM OF HIMACHAL PRADESH

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Abstract

Wild boar (Sus scrofa L.) is a widely distributed mammal known for causing damage to various agricultural crops during crops development stages. In the present study preliminary observation on the prevalence and damage of wild boar in agricultural crops in Punjab were undertaken. From September2023 to september2024 the wild boar was observed at the regions of district Una Himachal Pradesh. A total of 10 villages were surveyed for prevalence of wild boar. Questionnaire survey method was used and 5 farmers from each village were selected making a total of 50 farmers. Questions related to the behavior and damage pattern were asked to the farmers. It was observed that the majority of the farmers gave resulting positive responses regarding damaged status of wild boar. Wild boar presence was recorded in 8 villages a lot of total surveyed villages during the study. According to the survey 80% farmers were agreed that wild boar caused more damage to their crops. According to 85% of farmers agreed that barbed fencing was the most effective way to prevent wild boar in their crops. Direct visual observations in the fields revealed significant evidence of wild boar activity, with pug marks (50%) of the total observations of cases and rooting activities (40%). The damage to agricultural crops was particularly severe, affecting maize, vegetables like potatoes, and fodder crops such as sorghum. Wild boars contribute to this destruction by trampling and consuming crops, resulting in substantial economic losses for farmers. The distribution of food resources determined the differences in the habitats of wild boar. The study also revealed that farmers struggled to mitigate wild boar damage in their fields despite employing various indigenous or traditional management strategies. Further work of evaluation of different management strategies is going on and is the need of the hour.

PAPER ID- 113

EXOGENOUS TREHALOSE-MEDIATED MODULATION IN THE PERFORMANCE OF *BRASSICA JUNCEA* L. UNDER ARSENIC STRESS

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Abstract

Heavy metal contamination, particularly arsenic (As), poses significant challenges to plant growth and agricultural productivity, impacting various physiological and biochemical processes. This study investigates the impact of arsenic stress on the growth, water status, and photosynthetic parameters of *Brassica juncea* L. (Indian mustard), a crop of economic and ecological important. Alongside the ameliorative effects of exogenous trehalose (Tre), a natural osmoprotectant. The experimental design involved analyzing the effect of varying arsenic concentrations on the growth, morphological traits, photosynthetic efficiency of *B.juncea* seedlings. In parallel, the influence of trehalose supplementation at different concentrations was assessed. IC50 values of both arsenic and trehalose were determined to identify the optimal dosages for mitigating stress. Results indicated that arsenic exposure severely declined plant growth, reducing root and shoot length, water content, and photosynthetic efficiency. Photosynthetic pigments, including chlorophyll and carotenoid levels, were significantly reduced under arsenic stress. However, exogenous application of trehalose markedly improved these parameters. Trehalose-treated plants showed enhanced growth, with increases in root and shoot length, chlorophyll content, and carotenoid levels. Moreover, trehalose supplementation elevated stress-responsive metabolites, such as anthocyanins and xanthophylls, contributing to improved stress tolerance. These findings demonstrate that trehalose can significantly mitigate the negative impacts of arsenic on plant growth and physiological processes by promoting the accumulation of stress-responsive metabolites, trehalose offers a promising strategy to improve plant resilience and productivity in arsenic-contaminated environments.

PAPER ID- 114

ALTITUDINAL VARIATION OF PHYTOCHEMICALS AND ANTIOXIDANT ACTIVITY OF THREE DIFFERENT SPECIES OF *JUNIPERUS* IN COLD DESERT OF NORTH-WESTERN HIMALAYA

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Abstract

The phytochemical composition and antioxidant activity of various plant species are greatly influenced by the distinct climatic conditions found in the cold desert areas of the North-Western Himalaya. This study looks into how phytochemicals and antioxidant activity vary with altitude in three species of *Juniperus* (i.e., *Juniperus communis, Juniperus macropoda,* and *Juniperus recurva*), commonly found in this high-altitude, arid region. Owing to their bioactive components, these species are prized for their therapeutic values. Overall phenolic content, total flavonoid content, were examined in samples of *Juniperus* species. Nutritional analysis of nutrients like potassium and sodium were done using flame photometer. DPPH, ABTS, FRAP radical scavenging experiments were used to quantify antioxidant activity of species. Understanding how these phytochemicals and antioxidant qualities alter with altitude in different environmental variations at varying heights was the goal of the study. Quantitative determination of rutin and quercetin was done with the help of HPLC. It was observed that rutin and quercetin content was higher in berries than in leave. Phytochemical concentrations and antioxidant activity varied significantly between elevations, according to the data. *J. communis* berries from Kalpa exhibited the highest antioxidant activity across DPPH, ABTS, and FRAP assays, while *J. macropoda* leaves from Pooh showed the lowest activity in all three assays. These results show the impact of altitude on medicinal utility of *Juniperus* species, indicating that populations at higher elevations may provide more substantial therapeutic advantages. The fundamental processes underlying these differences and their consequences for the preservation and application of these species in conventional medicine may be investigated further.

PAPER ID- 115

ASSESSING THE NUTRITIONAL AND PHYTOCHEMICAL PROFILES OF *RUMEX NEPALENSIS* AND *RUMEX HASTATUS* ACROSS DIFFERENT ALTITUDES IN HIMACHAL PRADESH

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Abstract

Rumex nepalensis Spreng. and *Rumex hastatus* D. Don are wild edible plants recognized for their medicinal and nutritional properties. Their distribution across different altitudinal ranges likely influences their nutritional profiles. This study investigates the nutritional composition of *R. nepalensis* and *R. hastatus* collected from various altitudes in Himachal Pradesh, specifically from Shimla, Solan, and Sirmaur districts. Key nutritional parameters, including ash content, fat, fiber, carbohydrates, and protein levels, were analyzed to assess variation between species across altitudes. The results indicate significant differences between the two species at different altitudes. *R. hastatus* consistently exhibited higher ash content, with the highest recorded in Shimla (14.9 ± 0.46%), compared to *R. nepalensis* (13.47 ± 0.21%). The fat content in *R. hastatus* was notably higher in Sirmaur (14.3 ± 3.56%). Fiber content varied widely, with *R. nepalensis* from Sirmaur showing the highest fiber content (20.47% ± 2.76%), while *R. hastatus* from Solan demonstrated significant fiber levels (19% ± 3.08%). Carbohydrate and protein levels also varied significantly; *R. nepalensis* from Shimla had a carbohydrate concentration of 18.58 mg/g, whereas *R. hastatus* from Sirmaur showed 16.7 ±1.32 mg/g. Protein analysis revealed that *R. hastatus* from Shimla had the highest protein concentration (83.83 ± 3.51 mg/g), while *R. nepalensis* from Solan recorded 71.45 ± 3.58 mg/g. Additionally, *R. hastatus* from Shimla exhibited higher phenolic and flavonoid content.These findings suggest that *R. hastatus* from higher altitudes is nutritionally and phytochemically enriched, providing insights into the health benefits and ecological adaptations of these species across varying altitudinal.

PAPER ID- 116

ASSESSMENT OF WATER QUALITY, PLANKTON DIVERSITY, AND MICROPLASTICS DURING PRE AND POST MONSOON IN BEAS RIVER

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Abstract

The current study focuses on the examining the water quality, plankton diversity, and microplastic contamination during pre- and post-monsoon of Beas River of Mandi district. In order to comprehend the seasonal fluctuations in water parameters, plankton variety, and the incidence of microplastics the assessment was carried out. The investigation of water quality was predicated on important physicochemical parameters, including temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), turbidity, hardness, biochemical oxygen demand (BOD), and nutrient contents like phosphates, nitrates. By collecting samples and determining species richness and abundance in connection to the shifting environmental conditions brought about by the monsoon, plankton diversity was quantified. Significant changes in the community structure and quantity of both phytoplankton and zooplankton were shown by comparing the pre- and post-monsoon periods, which shed light on the productivity and health of the aquatic ecosystem. Utilising water sampling and filtration methods, microplastic contamination was assessed in order to identify and measure microplastics in various size ranges. The results showed that the post-monsoon period saw a rise in microplastic levels, which may have been brought on by runoff and human activity. Emphasising the necessity of sustainable management of aquatic ecosystems, this study offers vital baseline data for comprehending the effects of monsoon-driven changes on pollution levels, biological diversity, and water quality.

PAPER ID- 117

CARBON CAPTURE AND STORAGE (CCS) TECHNOLOGY AND ITS ROLE INMITIGATING CLIMATE CHANGE

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Abstract

Carbon capture and storage (CCS) technology has emerged as a vital tool in global efforts to mitigate climate change by reducing carbon dioxide (CO2) emissions from industrial processes and energy production. CCS involves capturing CO 2 at the point of emission, transporting it to designated sites, and injecting it into deep underground formations for long-term storage. Recent advancements in CCS, including direct air capture (DAC) and bioenergy with carbon capture and storage (BECCS), hold promise for improving efficiency and reducing costs. The technology is seen as a critical component in achieving the Paris Agreement's goal of limiting global temperature rise to 1.5°C, with potential applications in decarbonizing hard-to-abate sectors such as cement, steel, and fossil-fuel-based energy generation. While the scaling up of CCS is being prioritized in major projects around the world, such as Norway's Northern Lights and Canada's Boundary Dam, significant challenges remain. These include high operational costs, energy requirements, potential CO 2 leakage risks, and concerns that CCS may enable the continued use of fossil fuels. The integration of CCS with renewable energy systems and the development of effective regulatory frameworks are essential to overcoming these barriers. CCS's role in climate strategies, particularly in achieving net-zero emissions by 2050, underscores its importance as a bridge technology while the world transitions to cleaner energy sources. However, ongoing research is necessary to address technical, economic, and environmental uncertainties, ensuring that CCS can contribute meaningfully to global climate goals.

PAPER ID- 118

ETHNOMEDICINAL PLANT OF CHANSHAL VALLEY OF HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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Abstract

North Western Himalayan region is known for the unique and high value medicinal plant diversity. Communities residing in these regions are highly dependent on medicinal plants occurring in their area for curing various diseases and also gets monitory benefits by trading. Every region of the Himachal Pradesh has unique diversity of medicinal plants and own healthcare system. Currently medicinal plant diversity in Himachal Pradesh is declining very fast due to various anthropogenic pressure coupled with the continuously changing climate. Besides from last few decades a trend of excess collection of medicinal plants by local communities for economic purposes created an extra pressure on the existing wild populations. The present study has been carried out in the remote Chanshal valley of Shimla district. The region is bestowed with rich forests, stocked with a wealth of medicinal flora. The ethnomedicinal information about the use of plants was collected from the local people with the aid of semi-structured interviews. Some important medicinal plants used to cure various diseases are *Aconitum spp*., *Betula utilis*, *Dactylorhiza hatagirea*, *Bergenia stracheyi*, *Paris polyphylla*, *Polygonatum spp*., *Saussurea costus*, *Berberis aristata*, *Hedychium spicatum*, *Meconopsis aculeata*, *Podophyllum hexandrum*, *Rheum australe*, *Rhododendron anthopogon*, *Rhododendron companulatum*, *Taxus wallichiana*, *Thymus linearis*, *Trillium govanianum*,*Valeriana jatamansi* and *Viola spp*. Keeping in view of high potential of these medicinal plants in health and economic security of local communities' further studies on habitat ecology of the species, mass multiplication of commercially viable species through conventional and in vitro methods, and their establishment in the in situ and ex situ conditions suggested along with community awareness for their conservation.

PAPER ID- 119

DIVERSITY AND MOLECULAR PHYLOGENY OF ECTOMYCORRHIZAL ASSOCIATES OF *SHOREA ROBUSTA* AND ITS IMPACT ON THE EARLY GROWTH AND SURVIVAL OF SHOREA *ROBUSTA* SEEDLINGS

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Abstract

Purpose of present study is to identify the ECM associates of *Shorea robusta* (sal) and undertake artificial synthesis of ECM so as to raise semi-cultures of ECM partner and study the impact of ECM on the establishment and growth of sal seedlings. In the view of the above some dominant ectomycorrhizal associates of sal organically attached to the host plant roots were collected, cultured, systematically investigated and identified. The mycelium of associated mushrooms was raised into pure culture for raising mass inoculums which was prepared using wheat grains. The raised cultures were identified up to species level based on phylogenetic analysis of internal transcribed spacer region of nuclear ribosomal DNA (nrDNA). The colonised wheat grains were inoculated with the germinating sal seeds for establishing the ectomycorrhizal association. After three months' period, the inoculated and control plants were observed for growth parameters. Statistical analysis of data was conducted using one-way analysis of variance (ANOVA). Turkeys HSD test was used to assess the differences between control and different treatments. Overall growth was found to be maximum for seedlings inoculated with ECM fungus and growth was found to be significant with respect to control. The higher growth in inoculated seedlings may be due to mobilization of additional nutrients (P, K, Mg), water and protection from pathogenic fungi by associated mycorrhizal fungi.

PAPER ID- 120

SYSTEMATICS, MOLECULAR CHARECTERISATION, DIVERSITY AND DISTRIBUTION OF *MICRO-HETEROCERA* (INSECTA: LEPIDOPTERA) ON LATERITE PLATEAUS OF NORTH KERALA

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Abstract

The research focuses on the systematics, molecular characterization, and distribution modeling of micro-moths (*Microheterocera*) inhabiting the laterite plateaus of northern Kerala. Through comprehensive field surveys conducted across three seasons, over 200 micro-moth species were collected using UV light traps, revealing a high diversity of species adapted to these unique ecosystems. Molecular identification using mitochondrial COI gene sequencing allowed for precise taxonomic classification, with several species representing new records for the region. Diversity analyses, including Shannon-Weaver and Simpson's indices, indicated significant species richness and evenness, highlighting the ecological importance of these plateaus. Phylogenetic analysis using the MEGA software further clarified evolutionary relationships among the species, enhancing our understanding of their genetic diversity. Predictive distribution models using MAXENT and classification tree algorithms identified key environmental variables such as altitude, vegetation types, and precipitation seasonality as critical factors influencing moth distribution. The models demonstrated high predictive accuracy (AUC > 0.9), pinpointing regions of high conservation value across the laterite plateaus. This study presents a detailed taxonomic update of the *Microheterocera* species and underscores the conservation importance of the laterite plateaus. The findings advocate for increased protection of these ecosystems, which are under severe threat from land-use changes and habitat degradation.

PAPER ID- 121

ROLE OF CALCIUM AND VITAMIN D FOR HEALTHY BONES AND JOINTS AMONG FEMALES OF HIMACHAL PRADESH

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Abstract

The purpose of this study was to evaluate the Perception regarding Calcium, Vitamin D supplementation for Healthy Bones and Joints among females of Himachal Pradesh. Material &Methods**:** A descriptive cross-sectional survey was conducted amongst the 300 female participants in the age group of 19 to 65 years, using google forms. The questionnaire was circulated among female residents of Himachal Pradesh to gather information about their socio-demographic traits and Perception regarding Calcium, Vitamin D & supplementation for Healthy Bones and Joints. Epi info v7 software was used to evaluate the data using the necessary statistical tests. Results: In the present study, 38% (150) of the females were below 40 years of age while 62% (250) were above 40 years. The results of the study showed that the female participants' understanding of calcium, vitamin D, supplementation for healthy bones and joints was either insufficient or unsatisfactory. Most of the participated females know that the vitamin D, calcium are crucial for bone health but they had insufficient knowledge regarding the function, usefulness, dose, adverse effects of these nutritional supplements.

PAPER ID- 122

EFFECTS OF LIGHT POLLUTION ON DIVERSITY AND DISTRIBUTION OF LEPIDOPTERAN FAUNA

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Abstract

Developmental activities and lifestyle changes are global health concerns for humans and animals. Pollution from development, including air, soil, water, and noise, is an emerging threat. Light pollution, which affects all animals sensitive to light, may have larger effects than predicted. Urban expansion has led to increased artificial lighting, causing light pollution in both outdoor and indoor environments. This pollution includes adverse effects like sky glow, glare, and energy waste. Indoor light pollution compromises human health, while chronic circadian, sleep, and hormonal disruption may pose longer-term health risks. Wildlife also faces threats due to altered physiology, disrupting ecosystems, and altering predator-prey relations. Light pollution negatively impacts Lepidopteran diversity, particularly moths. Moths, nocturnal insects, rely on subtle cues to find food and pollinate flowers. White, bright flowers during night time can overload moths' senses, making them vulnerable to predators. Millions of moths die each year due to exhaustion from light exposure. Studies show that butterflies roosting near artificial illumination can become disoriented the next day due to interference with their circadian rhythms. Understanding the effects of light pollution on different Lepidoptera families is crucial for conservation. Creating and preserving dark zones in natural areas can help protect wildlife that depends on natural light cycles for survival. By raising awareness and taking action, we can safeguard both human health and biodiversity for future generations.

PAPER ID- 123

MICROPLASTIC POLLUTION IN LAKES OF INDIAN HIMALAYAN REGION: A REVIEW ON CURRENT STATUS AND FUTURE PERSPECTIVES

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Abstract

Microplastics are small plastic particles ranging in size from 1 μm to 5 mm. These synthetic particles are further classified as primary or secondary depending on their origin. Primary MPs are intentionally manufactured in micron size range on an industrial scale whereas secondary MPs are formed predominantly from the fragmentation or break down of larger plastics, which can occur due to temperature variation, mechanical damage, UV rays or biodegradation. Microplastics have detrimental effects on humans and aquatic organisms. They have the ability to absorb organic contaminants and pathogens from their surrounding environment, owing to their larger surface area relative to their volume. Microplastic pollution is an emerging environmental concern, particularly in fragile ecosystems such as the lakes of the Indian Himalayan region. Lakes are vital ecosystems that support diverse life forms and provide essential resources for human societies. While microplastic pollution in oceans has received significant attention, the effects on freshwater ecosystems such as lakes have remained relatively unexplored. This review highlights current research on the prevalence, types and methods utilized for identification and screening of microplastics in these sensitive freshwater systems. By examining existing studies, we identify key pathways through which microplastics enter lake environments, including urban runoff, tourism, and agricultural practices. This paper underscores the urgent need for targeted research and policy interventions to address microplastic contamination in the Indian Himalayan lakes.

PAPER ID- 124

UNRAVELING THE EFFECTS OF SHAM: HOW INHIBITED RESPIRATION HAMPERS WHEAT SEED DEVELOPMENT

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Abstract

Salicyl hydroxamic acid (SHAM) is widely used as an inhibitor of the alternative oxidase (AOX) pathway in plants, which plays a crucial role in modulating respiration and managing reactive oxygen species (ROS). This study examines the effects of SHAM on wheat (*Triticum aestivum*) seed development, focusing on key physiological and metabolic outcomes. The inhibition of the alternative respiratory pathway by SHAM disrupts the seed's ability to manage energy production and ROS detoxification, leading to several developmental challenges. Our findings show that SHAM-treated wheat seeds experience reduced ATP production due to the inhibition of the alternative oxidase pathway, which limits their flexibility in managing energy needs during critical stages of seed maturation and germination. The increased accumulation of ROS, as a result of AOX inhibition, causes oxidative stress, leading to damage in cellular components such as lipids, proteins, and DNA. This stress contributes to delayed germination, stunted seedling growth, and reduced overall biomass. Furthermore, SHAM-treated wheat seeds show signs of hormonal imbalances, particularly affecting ethylene and abscisic acid (ABA) signaling, which are essential for proper seed maturation and dormancy regulation. Additionally, mitochondrial function is impaired, with limited capacity to bypass the cytochrome pathway, resulting in metabolic inefficiencies. Wheat seeds subjected to SHAM treatment may attempt compensatory responses, but these are often inadequate, resulting in compromised growth and development. In conclusion, SHAM negatively affects wheat seed development by inhibiting alternative respiration, reducing energy availability, increasing oxidative stress, and disrupting hormonal balance. These effects culminate in delayed germination and stunted growth, highlighting the critical role of the AOX pathway in wheat seed development and stress management.

PAPER ID- 125

Native PAGE Analysis of Protein Alteration in Mice Exposed to Diclofenac. A Study of Hepatic Toxicity.

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Abstract

Diclofenac, a widely used non-steroidal anti-inflammatory drug (NSAID), has been associated with potential hepatic toxicity. This study aims to investigate the protein alterations in the liver of mice exposed to Diclofenac using Native Polyacrylamide Gel Electrophoresis (PAGE). Adult male mice were divided into control and Diclofenac-treated groups, with varying doses administered for a specified duration. Following treatment, liver tissues were harvested, and protein extracts were prepared for Native PAGE analysis. The resulting gels were examined for changes in protein expression profiles that could indicate alterations in hepatic function. Comparative analysis revealed significant differences in banding patterns between the control and treated groups. Notably, several protein bands exhibited alterations in intensity and migration, suggestive of dysregulation in hepatic protein synthesis and function due to Diclofenac exposure. These protein abnormalities were further correlated with histopathological findings, pointing to potential biochemical mechanisms underlying Diclofenac-induced liver toxicity. This study provides valuable insights into the molecular effects of Diclofenac on liver tissue and underscores the importance of Native PAGE as a tool for elucidating protein alterations in toxicological research. Our findings contribute to a greater understanding of NSAID-induced hepatic toxicity and may inform clinical considerations regarding the safe use of Diclofenac in therapeutic settings.

PAPER ID- 126

INSILCO PHYLOGENETIC STUDIES ON BUTTERFLIES OF FAMILY PIERIDAE (SUBORDER: RHOPALOCERA; ORDER: LEPIDOPTERA)

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Abstract

Butterflies, members of the order Lepidoptera and suborder Rhopalocera, are one of the most diverse and widely distributed groups of insects, renowned for their vibrant colors and ecological significance. Their unique evolutionary adaptations make them an excellent model for phylogenetic studies to unravel the complex relationships prevailing among different butterfly taxa. The present study as focused on the insilico COI gene-based phylogenetic analyses within the butterfly family Pieridae, so as to understand genetic distances and evolutionary relationships. Needless to say, traditional methods relying on morpho-anatomy and ecology have their limitations; therefore, molecular and in silico approaches have lately been pursued. The authors retrieved COI gene sequences in FASTA format, from public databases, including BOLD (Barcode of Life Data Systems) and NCBI (National Center for Biotechnology Information). In all sequences of 48 species from 14 genera and referable to 4 subfamilies within Pieridae were downloaded. Each sequence was authenticated through NCBI's taxonomy browser by 'blastn' to ensure 100% similarity with existing COI gene libraries. Using MEGA 11 (Molecular Evolutionary Genetics Analysis) software, the authenticated CO1 gene sequences were analysed by employing various methods such as Neighbor-Joining (NJ), Maximum Parsimony (MP), Maximum Likelihood (ML), and UPGMA (Unweighted Pair Group Method with Arithmetic Mean) to construct phylogenetic trees. The findings revealed intricate evolutionary relationships and distinct lineages within the family, highlighting significant diversification events and ancient divergences. The resulting phylogenetic trees offer a detailed perspective on the evolutionary history of Pieridae, elucidating genetic relationships among species, genera, and subfamilies. This research contributes to a deeper understanding of the evolutionary processes that shape butterfly diversity and showcases the potential of integrating molecular data with in silico methods for future phylogenetic studies.

PAPER ID- 127

DIVERSITY AND DISTRIBUTION PATTERN OF ORCHIDS IN KANGRA DISTRICT OF HIMACHAL PRADESH, NORTHWEST HIMALAYA

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Abstract

Kangra district is located between 31º 21′ – 32º 59′ N latitude and 75º 47′ – 77º .45′ E longitude in the Western part of Himachal Pradesh. Having a geographical area of 5739 km^2 , it borders Chamba in North, Lahul and Spiti in Northeast, Kullu in East, Mandi in Southeast, Hamirpur and Una in South and Punjab in Southwest. The district lies across several mountain ranges each contributing to the region a diverse geography and varied climate. A total of 19 orchid species belonging to 16 genera of two subfamilies (Epidendroideae, Orchidoideae) have been documented from this district so far. Six species (*Aeridies multiflora*, *Dendrobium amoenum*, *Gastrochilus calceolaris*, *Rhynchostylis retusa*, *Thunia alba* var. *bracteata*, *Vanda cristata*) are epiphytic in habit and grow chiefly on rough barks of their broadleaved phorophytes. They occur mainly in low hills up to 1500 m altitude due to warm and humid conditions. Them remaining species are ground growing, which include three leafless mycoheterotrophs (*Epigonium aphyllum*, *Gastrodia falconeri*, *Neottia listeroides*). These grow in a wider range of environmental conditions in shaded to exposed woodlands and grasslands. Most of the orchids are monsoon blooming. Owing to their therapeutic properties, some species belonging to genera *Crepidium*, *Habenaria* and *Herminium*, are extracted illegally and unscientifically from wild, thus leading to shrinkage of their natural populations. The number of orchid species in this district may swell as there are still many pockets which need to be explored thoroughly.

PAPER ID- 128

NEW RECORDS OF *ANDRENA* BEES (HYMENOPTERA: ANDRENIDAE) FROM JAMMU & KASHMIR INDIA, ALONG WITH AN UPDATED CHECKLIST OF JAMMU, KASHMIR AND LADAKH

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Abstract

Family Andrenidae commonly called mining bees or sand bees because they excavate tunnels in the soil. They belong to an insect order Hymenoptera and are the critical pollinators of many wild crops, fruits, pulses, fodder and flowering plants. The family Andrenidae is represented by 3000 species under 4 subfamilies and 5 genera across the globe (Michener 2000; Ascher and Pickering 2023). In India, only a single extant genus *Andrena* has been reported so far, with 36 valid species occurring in India (Gautam R.K. et al., 2024).The present study covers the fauna diversity of *Andrena* bees of the family Andrenidae Latreillie, 1802. Based on the extensive survey carried out from 2021-2023 and previous species records from India, the family Andrenidae is represented by 36 valid species from India under single genus Andrena and 12 subgenera. In Jammu , Kashmir and Ladakh , based on the recent survey and previously published literature the family Andrenidae is represented by valid 11 Species . Here from Rajouri and Pahalgam of Jammu and Kashmir two Species of *Andrena* bees have been reported new for the Jammu and Kashmir Himalayas namely, *Andrena (Euandrena) murreensis*. Cockerell, 1923 and *Andrena (Pallandrena) morosa*, Cameron, 1897.

PAPER ID- 128

EMERGING NANOMATERIALS FOR TARGETED BIOREMEDIATION: ADVANCES, CHALLENGES, AND FUTURE PROSPECTS

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Abstract

Role of nanoparticles in different areas of concern and targets. The field of bioremediation has experienced transformative advancements with the emergence of nanomaterials, which offer enhanced precision and efficiency in addressing environmental contamination. This review explores the latest developments in nanomaterials designed for targeted bioremediation, highlighting their potential to revolutionize soil, water, and air treatment processes. Key advances include the development of highly specific and efficient nanomaterials, the integration of hybrid systems, and innovative surface modifications that improve targeting capabilities. We examine case studies illustrating the successful application of nanomaterials in soil remediation, water treatment, and air purification, demonstrating their effectiveness in removing pollutants and enhancing environmental quality. Despite these advancements, challenges remain, including concerns about toxicity, environmental impact, and the high cost of implementation. The review also addresses future prospects, emphasizing the need for further research to optimize nanomaterial design, integrate emerging technologies, and develop regulatory frameworks to ensure safe and effective use. By providing a comprehensive overview of current trends, challenges, and future directions, this review offers insights into how nanomaterials can advance the field of targeted bioremediation and contribute to sustainable environmental management.

PAPER ID- 221

GESTATIONAL CHANGES IN THE CEREBELLUM OF GADDI SHEEP: A PRENATAL STUDY

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Abstract

This study investigated the development of the cerebellum in 54 Gaddi sheep fetuses at various

gestational stages. The fetuses were categorized into four groups based on their gestational age:

Group I (30-60 days), Group II (61-90 days), Group III (91-120 days), and Group IV (121 days

to full term). The age of the embryos (in days) was calculated using the formula Y = 2.74X + 30.15, where Y represents the age in days, and X is the crown-rump length (CRL) in centimeters.A significant (p<0.05) increase in cerebellar weight was observed across all groups, particularly from Group I to Group III and continuing into Group IV. Additionally, both the length and width of the cerebellum showed significant increase from Group I to Group IV. The cerebellum appeared as a dumbbell-shaped structure as early as 67 days of gestation. The external granular layer, characteristic of the fetal cerebellum, was observed in Group I. By 96 days, Purkinje cells had formed a distinct layer. In Group IV fetuses, the Purkinje cell layer was composed of a single row of uniformly distributed flask-shaped cells located along the upper boundary of the inner granular layer.

PAPER ID- 222

GENETIC EVALUATION OF CMS BASED CAULIFLOWER HYBRIDS IN NORTH WEST HIMALAYAS

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Abstract

The present investigation was undertaken to study the genetic performance of CMS-based cauliflower hybrids and inbreds, focusing on curd yield and its related traits. The experiment comprising of 20 treatments i.e. 16 hybrids and 4 in-breds including one standard check was laid out in Randomized Block Design with three replications at the Research and Demonstration Farm, Krishi Vigyan Kendra Mandi at Sundernagar under CSKHPKV, Palampur during the Rabi season of 2023-24. The study assessed various traits including days to curd initiation, number of open leaves per plant, leaf length and width, plant height, curd equatorial and polar diameters, stalk length, curd compactness, gross plant weight, net curd weight, percentage of non-marketable curd, harvest duration, curd yield, total soluble solids (TSS), ascorbic acid content, and marketable curd weight. The results revealed that marketable curd weight showed a positive and significant correlation both at phenotypic and genotypic levels with majority of the traits viz., gross plant weight, number of open leaves per plant, leaf length, leaf width, plant height, curd equatorial diameter, curd polar diameter, curd compactness and net curd weight. Whereas, days to curd initiation, stalk length and non-marketable curd also played a significant role in contributing to curd yield but the direction was negative. The result indicated field based empirical evidence that the hybrids viz., Him Palam Phoolgobhi Hybrid -1 (433.72 q ha -1) followed by Him Palam Phoolgobhi Hybrid-2 (418.91q ha -1), DPCafH-10 (377.43 q ha -1), DPCafH-13 (372.89 q ha -1) and DPCafH-1 (368.49 q ha -1) and inbreds DPCaf-W1-3-1 (416.22 q ha -1) followed by DPCaf -US (336.84 q ha -1), respectively were found superior than the other hybrids and standard check Pahuja -71 (214.37 q ha -1) in terms of yield and quality. These hybrids and inbreds are therefore recommended over Pahuja -71 for the North West Himalayas, if the expected goal is to achieve higher yield.

PAPER ID- 223

SUSTAINABLE FARMING IN HIMACHAL PRADESH AND ITS CHALLENGES

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Abstract

Sustainable farming aims to meet the growing food demands while protecting the environment and preserving resources for future generations. However, several challenges hinder its widespread adoption. One major challenge is economic feasibility. Sustainable practices often require upfront investments in technology, training, and infrastructure, which can be prohibitive for small-scale farmers. These methods, such as organic farming or crop rotation, may initially yield lower productivity compared to conventional farming, making it harder for farmers to stay profitable. Another issue is resource scarcity, particularly water and arable land. Sustainable farming relies on efficient resource management, but climate change and population growth are straining these resources. As water supplies dwindle and land becomes more degraded, maintaining sustainable practices becomes increasingly difficult. Furthermore, lack of knowledge and education is a significant barrier. Many farmers, especially in developing regions, lack access to information or training on sustainable practices. This knowledge gap can prevent them from adopting techniques like agroforestry or precision agriculture, which are critical for long-term sustainability. Policy and market pressures also play a role. Government subsidies and market systems often favour large-scale, conventional farming, making it harder for sustainable farming methods to compete. Additionally, the absence of robust policy frameworks supporting sustainability efforts limits their broader implementation. To overcome these challenges, a concerted effort involving technological innovation, supportive policies and education is necessary to make sustainable farming both viable and attractive to farmers worldwide.

PAPER ID- 224

Abstract

A field experiment was conducted in Rabi 2023-24 at Experimental Farm of Fodder Section, Department of Genetics and Plant Breeding, CSKHPKV, Palampur to study the effect of various nutrient management practices on single cut fodder oat. The variety Kent of oat was sown on 5th November 2023. The experiment consisted of eleven treatments which were studied in a randomized block design with three replications. The treatments under the study were: Recommended dose of nitrogen (RDN) 100 kg/ha, 75% RDN + nano urea @2ml/l of water, 50% RDN + nano urea @2ml/l of water, 75% RDN + nano urea @4ml/l of water, 50% RDN + nano urea @4ml/l of water, 75% RDN + nano urea @6ml/l of water, 50% RDN + nano urea @6ml/l of water, 75% RDN + Urea spray 2%, 50% RDN + Urea spray 2%, RDN + water spray and Control (without nitrogen N). The soil was silty clay loam in texture, acidic (5.45) with low nitrogen (224.7 kg/ha), medium phosphorus (14.3 kg/ha) and potassium (175 kg/ha). The application of recommended dose of nitrogen resulted in significantly better growth attributes such as plant height (126.4 cm) and shoot number (526.6). Applying recommended dose of nitrogen resulted in the highest green (272.0 q/ha), dry fodder yield (66.2 q/ha), crude protein yield (593.5 kg/ha), ADF yield (2865.0 kg/ha), NDF content (60.2 %) and yield (3987.4 kg/ha). However, the lowest green (91.0 q/ha), dry fodder yield (22.0 q/ha) and quality in terms of crude protein content (7.8%) was observed in the absolute control. Similarly, the highest soil available nitrogen (241 kg/ha) was recorded with the application of recommended dose of nitrogen. Crop economics in terms of gross (88414 ₹/ha), net returns (51192 ₹/ha) and benefit cost ratio (1.38) was found to be the best with the application of recommended dose of nitrogen. The lowest gross (29595 ₹/ha), net returns (1995 ₹/ha) and benefit cost ratio (0.07) was recorded in the absolute control.

PAPER ID- 225

EXPLORING THE MULTIFACETED BENEFITS OF AEGLE MARMELOS: A COMPREHENSIVE REVIEW

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Abstract

Aegle marmelos (bael). has indeed been known to have mythical significance till ancient times in India. Bael tree parts like leaves, fruit and roots has therapeutic significance in Ayurveda as well as other traditional systems of medicine for the treatment of various diseases. Advanced research successfully endorsed the pharmacokinetic profile of bael by uncovering the existence of valuable phytochemicals. Experiments have said the antioxidant, antimicrobial nature of bael, which assists to suppress gastrointestinal problems, has different cardiac problems along with proven anti-venom activity. Along with anti-diabetic, hepato-protective, wound healing along with radio-protective, activities also are showcased. The objective of this review is to light up the physiology as well as importance of such a traditionally used endangered medicinal tree along with the ethno – medicinal significance within each part of the tree, its nutritious and phytochemical stereotyping.

PAPER ID- 226

EVALUATION OF ANTIOXIDANT ACTIVITIES OF *VOLVARIELLA VOLVACEA* (BULL.) SINGER (PADDY STRAW MUSHROOM)

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Abstract

Volvariella volvacea is a nutrient rich tropical mushroom that has recently attracted attention of people due to its nutraceutical values. In the current study the acetone, aqueous and methanol extracts of fruiting bodies were evaluated for antioxidant property based on reducing power, radical (DPPH) scavenging activity and total phenolic contents. The superoxide dismutase activity (SOD), ascorbate peroxidase (APX) activity and non-protein thiol (NPT) contents of the fruiting bodies were also evaluated. Results showed reducing power 0.096 (acetone extract), 0.197 (aqueous extract) 0.335 (methanol extract). Radical scavenging activity (RSA) 77.618 % and IC_{50} 304.03 µg/ml in aqueous extract, 61.205% and IC_{50} 410.99 µg/ml in methanol extract, 13.970% and IC_{50} 1770.32 µg/ml in acetone extract. Total phenol content were found 1.612 µg GAE/mg DW in acetone extract, 2.045µg GAE/mg DW in aqueous extract and 1.928 µg GAE/mg DW in methanol extract. The fruiting bodies of the mushroom also showed superoxide dismutase activity (3.47 U/mg protein), ascorbate peroxidase activity (2.11µ moles /mg protein min^{-1}) and Non-Protein Thiols (2.360 µ moles/g DW). The study revealed high antioxidant activities; hence the mushroom should surely be incorporated into our daily diets in order to improve the nutrition, health and the general well-being of the people and further investigated for their medicinal purposes.

PAPER ID- 227

EFFECT OF PRE-SOWING TREATMENTS ON GERMINATION PARAMETERS AND SEEDLING VIGOUR INDEX OF *BETULA UTILIS* D. DON

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Abstract

A germination trial was conducted to study the effect of pre-sowing treatments on germination parameters and seedling vigour of *Betula utilis* D. Don under Laboratory conditions. The seeds of *B. utilis* collected from Barda Forest in Rakchham village in Baspa valley of Kinnaur district were treated with six different concentrations of Gibberellic Acid (GA3) as pre-sowing treatments viz., GA 3 50ppm, GA 3 100ppm, GA 3200ppm GA 3 300ppm, GA 3 400ppm and GA 3 500ppm and control to study their effect on germination behaviour and seedling vigour index. Significant differences were observed in the various germination parameters, seedling length and the seedling vigour index of B. utilis treated with different pre-sowing treatments. The maximum germination per cent (79%), mean daily germination (3.76%), germination value (5.79), germination speed (9.07), seedling length (3.77cm) and seedling vigour index (297.83) were recorded in seeds treated with GA 3 100ppm whereas maximum peak value (1.58) was recorded in seeds treated with GA 3 400ppm and maximum germination energy (38.00) was recorded in seeds treated with GA 3 500ppm. The minimum germination per cent (61.33%), mean daily germination (2.92%) and germination speed (7.07) were recorded in seeds treated with GA 3 500ppm whereas minimum peak value (1.26), germination value (3.78), seedling length (2.25cm) and seedling vigour index (143.35) was recorded in seeds which were not given any pre-sowing treatment (control) and minimum germination speed (7.07) was recorded in seeds treated with GA 3 500ppm. Therefore, seeds of *B. utilis* should be treated with GA 3 100ppm before sowing in the nursery to get better germination and seedling growth.

PAPER ID- 228

DEVELOPMENT AND EVALUATION OF *MORINGA OLEIFERA* SEEDS EXTRACT LOADED MICROEMULSIONS FOR ENHANCED TOPICAL DELIVERY OF ATOPIC DERMATITIS

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Abstract

Atopic dermatitis is a chronic inflammatory skin condition characterized by intense itching, significantly impairing quality of life. Besides social stigma and sleep disturbances, it leads to skin damage. Conventional treatments involving frequent emollient and topical medication use, often with steroids and antihistamines, pose long-term chemical exposure concerns. Recently, complementary therapies like *Moringa oleifera* have garnered attention due to their therapeutic potential.

PAPER ID- 229

CARBON CAPTURE AND STORAGE (CCS) TECHNOLOGY AND ITS ROLE INMITIGATING CLIMATE CHANGE

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Abstract

Carbon capture and storage (CCS) technology has emerged as a vital tool in global efforts to mitigate climate change by reducing carbon dioxide (CO2) emissions from industrial processes and energy production. CCS involves capturing CO 2 at the point of emission, transporting it to designated sites, and injecting it into deep underground formations for long-term storage. Recent advancements in CCS, including direct air capture (DAC) and bioenergy with carbon capture and storage (BECCS), hold promise for improving efficiency and reducing costs. The technology is seen as a critical component in achieving the Paris Agreement's goal of limiting global temperature rise to 1.5°C, with potential applications in decarbonizing hard-to-abate sectors such as cement, steel, and fossil-fuel-based energy generation. While the scaling up of CCS is being prioritized in major projects around the world, such as Norway's Northern Lights and Canada's Boundary Dam, significant challenges remain. These include high operational costs, energy requirements, potential CO 2 leakage risks, and concerns that CCS may enable the continued use of fossil fuels. The integration of CCS with renewable energy systems and the development of effective regulatory frameworks are essential to overcoming these barriers. CCS's role in climate strategies, particularly in achieving net-zero emissions by 2050, underscores its importance as a bridge technology while the world transitions to cleaner energy sources. However, ongoing research is necessary to address technical, economic, and environmental uncertainties, ensuring that CCS can contribute meaningfully to global climate goals.

PAPER ID- 230

GLOBAL CLIMATE CHANGE AND MALARIA: A REVIEW BASED ONRECENT SCIENTIFIC STUDIES

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Abstract

Climate change is a global threat associated with human health and the progression of several diseases. Malaria is one of these diseases that is closely affected by global climate change. It is one of the biggest killers of mankind in recent times. The World Health Organization (WHO) reported that there were 249 million cases of malaria in 2022 with a total of 6, 08,000 deaths globally. The current study is a review-based analysis relying on secondary data collected from recent studies performed on malaria. It is predicted that by the year 2080, climate change will change malaria regions and prevalence zones. Climate change can affect the length of the malaria transmission season in many areas. Few studies have highlighted that malaria with climate change will have longer transmission seasons, increased transmission rates, and an increased risk of outbreaks. Warmer temperatures, increased humidity, and heavier rainfall can cause mosquito populations to grow at higher altitudes and in new areas. Changes to the El Niño cycle can increase the transmission of malaria and other mosquito-borne diseases. Climate change is expected to increase the geographic range of malaria and the number of people at risk of the disease. Malaria cases have been reduced due to better diagnosis and effective treatment in the past few years but climate change in the future is expected to reverse the recent decline in malaria cases and deaths globally.

PAPER ID- 231

TAXONOMY AND DNA BARCODES OF THE FAMILY PHILOPOTAMIDAE (TRICHOPTERA:INSECTA) FROM INDIA

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Abstract

The family Philopotamidae, commonly known as finger-net caddisflies, under the suborder Annulipalpia, is represented by 1508 species under 26 genera all over the Globe and 625 species are inhabitants in the Oriental region. In India, the family is represented by 7 genera and 155 species. These organisms are significant bioindicators of water quality and are crucial in the aquatic food web. Despite their ecological importance, the taxonomy and molecular profiling of Philopotamida*e* in India remain inadequately explored. This study aims to fill this gap by providing a comprehensive taxonomic revision and DNA barcode assessment of the Philopotamidae family in India. This study provides the first detailed taxonomic revision and DNA barcode analysis of the Philopotamidae family in India, contributing to the global efforts in cataloging biodiversity and understanding evolutionary relationships within Trichoptera. In the present study, we have identified seven species of Philopotamidae with notes on their DNA barcodes.

PAPER ID- 232

A STUDY ON PESTICIDAL POTENTIAL OF PLANT EXTRACT OF A NATIVE SPECIES, *BOENNINGHAUSENIA ALBIFLORA* (HOOK) TO RESTRAIN INSECT PESTS OF FORESTRY IN NORTH-WEST HIMALAYA

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Abstract

The present investigation was conducted to evaluate the biopesticide prospect of native herb species, *Boenninghausenia albiflora* (Hook) commonly known as Pissumar which is abundantly present in the temperate forest of North Western Indian Himalayas. Different formulations were prepared from the extract of the whole of above-ground plant parts which were evaluated to check the larval population of noctuid moths i.e *Agrotis ipsilon* (Hufnagel), a cutworm of conifer nursery and *Plecoptera reflexa* Guenee, (Lepidoptera: Noctuidae), a prominent defoliator of *Dalbergia sissoo* (Roxb.) in the Indian subcontinent. The LC 50 (%) values of *B. albiflora* at the interval of 24hrs, 48hrs, and 72hrs of treatment were 0.89, 0.88 and 0.81 against the *Plecoptera reflexa* defoliator followed by LC 50 (%) value of extract against the insect pest *Agrotis ipsilon* as 0.81, 0.91, and 0.86 respectively, with significant effect at $p \leq 0.05$. Detailed methodology along with biochemical characterizations of the chemical components extracted from the native plant commonly known as Pissumar have been carried out. Not only this but significant observations also well corroborated with the findings of the previous studies.

PAPER ID- 233

POPULATION DYNAMICS OF LEPIDOPTERA DIVERSITY OF SERAJ VALLEY,HIMACHAL PRADESH, INDIA

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Abstract

Lepidoptera, including butterflies and moths, are vital pollinators and bio- indicators, playing crucial roles in ecosystem health and biodiversity, serving as bioindicators, and contributing to food security, livelihoods, and carbon sequestration. Lepidoptera is the third-largest insect order after Coleoptera and Hymenoptera. This research examines Lepidoptera diversity in Seraj Valley, which lies within the Mandi and Kullu districts of Himachal Pradesh, highlighting species richness, seasonal variations, and habitat preferences in the North-western Himalayan region. There were recorded 50 species of butterflies and moths, primarily from families such as Nymphalidae, Papilionidae, Pieridae, Hesperiidae, Geometridae, Sphingidae, and Noctuidae. Systematic sampling using sweep nets and light traps, and visual observations were conducted across forests, grasslands, and agricultural areas of different altitudes over multiple seasons. The highest species richness occurred in mid-elevation forests, while agricultural areas had lower diversity due to habitat disturbance. Lepidoptera were most active before and after the monsoon season. The diversity of Lepidoptera is influenced by elevation, vegetation, and climate. Lower elevations (1000-2000 m amsl) have high diversity, particularly in the Nymphalidae and Noctuidae families. Mid-elevations (2000-3000 m amsl) show a shift towards specialist species. Higher altitudes (above 3000 m amsl) have decreased diversity but unique species like the Himalayan Apollo and various skippers were found, adapted to the challenging environment. The study underscores the need for conservation strategies to protect natural habitats and mitigate the effects of human activities, providing essential data for future monitoring and conservation efforts.

PAPER ID- 234

LIVING WITH A LARGE PREDATOR: ASSESSING THE ROOT CAUSES OF HUMAN–BROWN BEAR CONFLICT AND THEIR SPATIAL PATTERNS IN LAHAUL VALLEY, HIMACHAL PRADESH

Vineet Kumar, Amira Sharief, Ritam Dutta, Tanoy Mukherjee, Bheem Dutt Joshi, Mukesh Thakur, Kailash Chandra, Bhupendra Singh Adhikari, Lalit Kumar Sharma

Abstract

Brown bear-mediated conflicts have caused immense economic loss to the local people living across the distribution range. In India, limited knowledge is available on the Himalayan brown bear (HBB), making human–brown bear conflict (HBC) mitigation more challenging. In this study, we studied HBC in the Lahaul valley using a semi- structured questionnaire survey by interviewing 398 respondents from 37 villages. About 64.8% of respondents reported conflict in two major groups—crop damage (30.6%) and livestock depredations (6.2%), while 28% reported both. Conflict incidences were relatively high in summer and frequently occurred in areas closer to the forest (<500 m) and between the elevations range of 2700 m to 3000 m above sea level (asl). The dependency of locals on forest resources (70%) for their livelihood makes them vulnerable to HBC. The "upper lower" class respondents were most impacted among the various socioeconomic classes. Two of the four clusters were identified as HBC hot spots in Lahaul valley using SaTscan analysis. We also obtained high HBC in cluster II with a 14.35 km radius. We found that anthropogenic food provisioning for HBB, livestock grazing in bear habitats, and poor knowledge of animal behavior among the communities were the major causes of HBC. We suggest horticulture crop waste management, controlled and supervised grazing, ecotourism, the constitution of community watch groups, and others to mitigate HBC. We also recommend notifying a few HBB abundant sites in the valley as protected areas for the long-term viability of the HBB in the landscape.

PAPER ID- 264

DEVELOPMENT AND EVALUATION OF BABCHI SEED OIL AND *NIGELLA SATIVA* SEED OIL-LOADED TOPICAL NANO-EMULSION HYDROGEL FOR THE TREATMENT OF MILD PSORIASIS

Bhavika Verma[1], Prince[1], Raveen Chauhan[1], Bigul Bhardwaj[1], Poonam Negi [1*]

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Abstract

Psoriasis is a common chronic illness that affects 1% to 3% of people worldwide. Topical corticosteroids are the primary treatment, but long-term use can have side effects. Natural remedies like Babchi seed oil and *Nigella sativa* seed oil are considered safer alternatives for treating mild to moderate psoriasis.

PAPER ID- 265

DEVELOPMENT AND EVALUATION OF TRIPHALA EXTRACT SOLID DISPERSION-LOADED GASTRO-RETENTIVE RAFT SYSTEMS FOR THE AMELIORATION OF PEPTIC ULCER

Nitika[1], Shilpa Sharma[2], Nitika Thakur[1], Raveen Chauhan[1], Bigul Yogeshver Bhardwa[j1], Poonam Negi[1*]

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Abstract

Gastric ulcers (GU) are a common digestive disorder resulting from an imbalance between harmful and protective factors in the stomach. This imbalance disrupts the gastric mucosal barrier, increases cell permeability, depletes gastric mucus, and induces oxidative stress. Long-term use of non-steroidal anti-inflammatory drugs (NSAIDs) is a major contributor to GU. Existing allopathic treatments are associated with drawbacks like drug resistance, hypoacidity, and cardiovascular risks. A holistic approach combining Triphala, probiotics, and prebiotics may offer a promising alternative.

PAPER ID- 266

DEVELOPMENT AND EVALUATION OF NOVEL FORMULATION OF CHEBULINIC ACID FOR COLON SPECIFIC DRUG DELIVERY

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Abstract

Terminalia chebula, a common medicinal plant used in folk medicine like Unani, Ayurveda and Homeopathy is employed as major ingredient in Ayurvedic formulations. Chemical analysis of these formulations have revealed a number of pharmacologically interesting components including ellagic acid and chebulinic acid. Chebulinic acid has shown to exhibit antiulcer activity since it possesses antisecretory, antioxidative and anti-inflammatory action. Inspite of huge potential of chebulinic acid in gastrointestinal problems, its use in pharmaceutical field is limited because of its high hydrophobicity and poor aqueous solubility.

PAPER ID- 267

NIGELLA SATIVA OIL-LOADED ETHANOLIC VESICULAR GEL FOR IMIQUIMOD-INDUCED PLAQUE PSORIASIS: PHYSICOCHEMICAL CHARACTERIZATION, RHEOLOGICAL STUDIES, ANDIN VIVO EFFICACY

Kanika[1*], Samar Vihal [1] Swati Pundir [1] , Charul Rathore [2] , Uma Ranjan Lal [3] , Gaurav Gupta [4], Sachin Kumar Singh [5] , Kamal Dua [6] , Dinesh Kumar Chellappan [7] , Poonam Negi* [1]School of Pharmaceutical Sciences, Shoolini University, PO Box 9, Solan, Himachal Pradesh 173229, India;

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Abstract

The therapeutic effect of NS oil in mild to moderate psoriasis is limited owing to low play load of thymoquinone (15%w/w), irritation, dripping, low viscosity and thus, less contact time on the lesions.

PAPER ID- 268

DESIGN AND EVALUATION OF SELF NANOEMULSION-BASED DRUG DELIVERY OF SEA BUCKTHORN OIL FOR TREATING PCOS

Soumyadeep Khatua[1], Sourabh Patil[1], Lalit Sharma1 Bigul Yogeshver Bhardwaj[1], SamarVihal[1], Poonam Negi1[*1]

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Abstract

Among women of reproductive age, polycystic ovarian syndrome (PCOS) is a common endocrine condition marked by polycystic ovaries, hyperandrogenism, and ovulatory failure. The pulp oil from sea buckthorn (*Hippophae rhamnoides*), which is well-known for its bioactive and antioxidant qualities, may provide PCOS patients with an alternate treatment option. Its limited therapeutic value is due to its poor water solubility and chemical instability.

PAPER ID- 273

EFFICIENT PRODUCTION OF PROBIOTIC-BASED PARAPROBIOTICS USING HEAT-KILLED TREATMENT METHOD

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Abstract

Paraprobiotics, also known as non-viable probiotics, represent a promising advancement in the field of microbiome research and human health. Unlike traditional probiotics, which rely on the ingestion of live microorganisms to confer health benefits, paraprobiotics are inactivated or non-viable forms of these microbes, typically achieved through heat, UV irradiation, or pasteurization. Despite being non-living, these microbial components still provide significant health advantages, largely through immune modulation, interaction with gut microbiota, and anti-inflammatory effects. Lactic acid bacteria (LAB) play a crucial role in probiotics and gut health, comprising a diverse range of bacterial strains such as Lactobacillus, Bifidobacterium, and others. These bacteria are commonly found in various fermented foods, including meats, dairy products, vegetables, beverages, and baked goods. LAB are naturally found in various environments such as soil, water, manure, sewage, silage, and plants. Lactic acid bacteria (LAB) have garnered widespread attention for their diverse applications, including use as starter cultures in food and feed fermentations, biological control agents, probiotics,and in the pharmaceutical industry. Their multifunctional properties make them valuable in enhancing food safety, promoting health, and contributing to biotechnological innovations.The current study explores the production of heat-killed paraprobiotics involved subjecting probiotic microorganisms to controlled heat treatment, effectively inactivating them while preserving their beneficial components. This method enhances safety and stability, as the non-viable cells retain immunomodulatory and health-promoting effects, making them suitable for therapeutic and functionalfood applications without the risk of overgrowth.

PAPER ID- 275

THERAPEUTIC POTENTIAL OF *BOERHAVIA DIFFUSA* (PUNARNAVA): A COMPREHENSIVE REVIEW

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Abstract

Boerhavia diffusa, commonly referred as punarnava, is highly valued in traditional medicine since centuries. *Boerhavia diffusa* has cosmopolitan distribution and is found in various climates, including temperate, subtropical or tropical region across globe. It is an important component in various ayurvedic formulation as a rejuvenating agent and is referred as "Rasayan," due to its remarkable anti-aging and antioxidant properties. The review is aimed at to provide a thorough examination of existing literature related to ethnobotanical uses, phytochemicals, ethnopharmacological, pharmacological and possible therapeutic benefits of the species. In this context a comprehensive search was conducted across various digital databases, including Scopus, Web of science, Science Direct, PubMed, and DOAJ, Google Scholar. Known in Ayurvedic texts such as Sushruta and Charaka Samhita, B. diffusa is regarded as a medicinal plant used to treat a wide range of human ailments. The entire plant, including its leaves, flowers, roots, stem, and fruits, contains a diverse array of bioactive phytocompounds. *Boerhavia diffusa* is rich in secondary metabolites such as flavonoids, steroids, phenolics, alkaloids, and iso-flavonoids, all of which contribute to its varied biological activities. Pharmacological properties such as antimicrobial, anticancer, anti-inflammatory, immunomodulatory, antifertility, antidiabetic, reno-protective, antioxidant, and hepatoprotective effects have been observed in both crude extracts and isolated compounds. This study thoroughly examines the ethnobotanical uses, phytochemical composition, and pharmacological characteristics of the aerial and root sections of *Boerhavia diffusa*, highlighting its potential for the development of standardized natural therapeutic agents for future research and applications.

PAPER ID- 276

A COMPARATIVE STUDIES ON IMMOBILIZATION OF SERRATIOPEPTIDASE FROM *SERRATIA MARCESCENS* SPB-07 ON DIFFERENT MATRICES

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Abstract

The immobilization of enzymes has gained significant attention in biotechnology for enhancing enzyme stability, reusability, and activity. This study explores the immobilization of serratio-peptidase, a proteolytic enzyme known for its anti-inflammatory, fibrinolytic, and therapeutic properties, on various matrices such as sodium alginate, chitosan, agar, silica gel and polyvinyl alcohol (PVA). Each matrix was selected for its unique properties that may influence enzyme activity and stability. Sodium alginate provides a biocompatible and non-toxic medium, chitosan offers excellent biocompatibility with antimicrobial properties, agar provides a thermo-reversible gel structure, and PVA contributes high mechanical strength and stability. The immobilization process was evaluated based on enzyme activity, stability, reusability, and efficiency. The immobilized enzyme on different supports was characterized and enzyme activity assayed to compare the efficiency before and after immobilization. Results indicated that the choice of matrix significantly impacted the enzyme's catalytic efficiency and operational stability. Maximum enzyme immobilization efficiency (87.96 %) was obtained in sodium alginate method of immobilization, followed by chitosan (68.22 %) while agar and PVA exhibited more mechanical stability but relatively lower enzyme retention. The optimal pH (9 pH) of the immobilized enzymes was shifted to lower values than for the purified free enzyme. The optimum reaction temperature remained same i.e., 37°C for both the purified free as well as immobilized enzyme. This work provides insights into the optimal selection of matrices for immobilization of Serratio-peptidase to enhance its application in various therapeutic and industrial processes.

PAPER ID- 277

IN-VIVO INVESTIGATION TO ASCERTAIN THE EXTRACT OF *THALICTRUM FOLIOLOSUM*'S HEPATOPROTECTIVE POTENTIAL

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Abstract

Traditionally used "Restorative Herb," *Thalictrum foliolosum* contains rich bioactive compounds with potent free radical scavenging properties. This study explored its potential to combat liver damage. Root extracts (methanolic, ethanolic, hydroalcoholic, aqueous) were assessed for their content of flavonoids and phenolics, known for their antioxidant effects. The study induced liver damage in rats using paracetamol and then evaluated the protective effects of the extracts compared to a standard drug. All extracts significantly reduced liver enzyme activity and bilirubin levels, while increasing total protein levels, indicating improved liver function. Methanol:chloroform (1:1) extract showed the strongest protective effect, confirmed by near-normal liver architecture observed during histological examination. These findings suggest that *Thalictrum foliolosum* extracts, particularly the methanol:chloroform (1:1) extract, possess significant hepatoprotective activity. This effect is likely due to the presence of flavonoids and phenolics, which can combat free radical damage and promote liver regeneration. Pretreatment with 100 and 200 mg/kg body weight of the methanol: chloroform root extract of *Thalictrum foliolosum* for 7 days offered significant protection against paracetamol-induced hepatic damage and the results were compared with standard hepatoprotective drug silymarin. 100mg/kg body weight of the methanol:chloroform root extract of *Thalictrum foliolosum* showed results as comparable with 100 mg/kg body weight of silymarin and 200mg/kg body weight of the methanol: chloroform root extract of *Thalictrum foliolosum* showed better protection than silymarin. Both the doses of the methanol: chloroform root extract of *Thalictrum foliolosum* prevented histological changes caused by paracetamol.

PAPER ID- 278

NEW INSIGHTS ON METAL ION MODULATION OF *ASPERGILLUS NIGER* TANNASE

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Abstract

Tannase, a pivotal enzyme in various industries such as food and pharmaceuticals, holds the potential for diverse applications. This study investigates the impact of metal ions, particularly calcium (Ca) and heavy metals like mercury (Hg) and silver (Ag), on the activity and stability of tannase derived from *Aspergillus niger*. Experimental findings reveal a notable 1.42-fold increase in tannase activity in the presence of Ca ions, suggesting a regulatory role in enzyme activation. Kinetic analyses uncover the allosteric effects of Ca ions, as evidenced by a sigmoidal Michaelis-Menten graph, indicating modulation of enzyme conformation and catalytic activity. Conversely, heavy metal ions, notably Hg and Ag, demonstrate inhibitory effects, resulting in significant reductions in enzyme activity. Reactivation studies highlight the potential formation of coordination complexes between heavy metal ions and cysteine residues, implicating mechanisms of enzyme inactivation. Remarkably, reactivation with dithiothreitol (DTT) exhibits maximum efficacy with Hg (88.8%) and Ag (81.4%), indicating preferential binding to cysteine residues. Additionally, the study identified the allosteric nature of tannase, a previously unexplored aspect, shedding light on its novel regulatory mechanisms. Future research avenues include elucidating calcium-binding sites and understanding tannase gene regulation under varying physiological conditions. These findings emphasize the significance of metal ion interactions in enzyme functionality and provide insights for optimizing biotechnological processes. Understanding metal ion-mediated modulation of tannase activity holds promise for developing enhanced enzyme formulations for industrial applications, spanning from food processing to pharmaceutical production.

CHEMICAL SCIENCES

Paper ID: 130

Investigating photoluminescence emission as potentially useful characterization tool for surfactant stabilized core-shell/hybrid aqueous nano-dispersions

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Abstract

One of the characteristic features of the surfactant is their tendency to adsorb at the surface/interface, which involves transfer of surfactant molecules from bulk solution phase to the surface/interface. With the advancement in the synthesis methodologies of Nanoparticles (NPs) through colloidal chemistry routes, the adsorption tendency of surfactants is now being exploited in reference to the stabilization of the NPs. In present research, colloidal Hg/Cd sulphide (HgS/CdS) NPs with average sizes below 15 nm have been synthesized using simple chemical precipitation method in aqueous solutions of different surfactant. One of the most important II-IV semiconductor compounds, cadmium sulfide (CdS) is selected because of its direct band gap of 2.42 eV and its excellent size-dependent PL emission. A very interesting aspect to explore is how surfactants can control NP formation in systems of mixed precursors which then compete in the reaction, thereby allowing in principle for a variable formation of randomly mixed, individually separated or core-shell NPs. The other semiconductor material selected for the mixed precursor is HgS, which has poor optical and PL emission properties as compared to CdS. As established in our previous studies, HgS NPs do not show any PL emission in aqueous surfactant system. The changing PL emission of core-shell/hybrid nanostructures has emerged an interesting avenue to be establish as characterization tool. The ultimate aim of current research is to develop a much better understanding of the preparation of hybrid semiconductor NPs with tailor-made optical and electronic properties by simple methods based on surfactant control. The result of these studies will help to establish a PL emission-based protocol in understanding the changing surface structure of hybrid/core -shell semiconductors NPs.

Paper ID: 131

Psyllium Grafted with polyionic Liquids as a Multifunctional Biomedical Tools

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Abstract

The evaluation of the PILs and modified psyllium as lipid binders using cholesterol as model lipid has been studied. To explore another dimension of these materials in the biomedical applications, the anti-fungal property of the ILs were also evaluated. Cholesterol uptake was also studied for these biomaterials. The maximum uptake was observed for P[VImBu] + Br^-, i.e., 71.60 % and 56.08 % with IL grafted psyllium, i.e., psy[VImS] + Br^-. Maximum percent binding (P B) was observed for mustard oil. Similar results were obtained in all the cases while the anomalous behavior for P B was observed in the ILs grafted psyllium. The study revealed that there is a pronounced effect of anion as well as the cation on the fungal activity and possessed the maximum antifungal activity against Mucor circenelliods and it was found to be highly effective.

Paper ID: 132/133

Integration of Chemical Sciences in Materials and Biological Sciences

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Abstract

The convergence of chemical sciences with materials and biological sciences has catalyzed significant advancements in both fields. At the core of this integration is the understanding of molecular interactions and the manipulation of chemical bonds, which underpin material properties and biological functions. In materials science, chemistry plays a crucial role in the design and synthesis of new materials, ranging from polymers and composites to advanced nonmaterial's. The chemical composition and structure of these materials dictate their mechanical, electrical, and optical properties, enabling the development of materials with tailored functionalities. Innovations such as organic electronics, energy storage materials, and biomimetic materials owe their progress to advances in synthetic chemistry and molecular engineering. In biological sciences, chemical science provides a framework for understanding

complex biological systems at a molecular level. The study of biomolecules such as proteins,

nucleic acids, lipids, and carbohydrates is grounded in their chemical structure and interactions. Chemical biology, a field bridging chemistry and biology, has enabled the manipulation of biological systems using synthetic molecules, facilitating drug discovery, therapeutic interventions, and diagnostics. Techniques such as chemical labeling, bio conjugation and molecular imaging rely heavily on chemical principles to visualize and manipulate biological processes. A major area of intersection is in the development of biomaterials and biocompatible systems, which are designed for medical applications such as drug delivery, tissue engineering, and regenerative medicine. These materials are engineered using knowledge from both material science and biology, with chemical principles guiding their design to ensure proper interaction with biological tissues. This integration of chemical sciences into both materials and biological sciences continues to drive innovations in fields such as nanomedicine, catalysis, and environmental sustainability, offering new solutions to complex global challenges.

Paper ID: 134

Green synthesis of tri-metallic (Zn/PbMn) nanoparticles using *Punica granatum* (Pomegranate) exocarp extract and their application

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Abstract

Synthesis and production of metallic nanoparticles like gold bars, silver, platinum and palladium by using plant parts are in great trend due to their superior properties. In present studies, *punica granatum* (pomegranate) extract-based tri-metal bio-nanoparticles has been prepared by co-precipitation method. The prepared bio-nanoparticles were characterized with Transmission Electron Microscopy (TEM), Scanning electron microscopy (SEM), X-Ray diffraction (XRD), X-Ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy (FTIR), Thermogravimetric analysis (TGA). XRD analysis revealed the semi-crystalline morphology of the composite. These tri-metal nanoparticles were explored for the photodegradation of organic pollutants and also examine antimicrobial activity against different bacteria.

Paper ID: 135

Carbon Farming

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Abstract

Carbon farming refers to agricultural practices aimed at capturing and storing atmospheric carbon dioxide (CO_2) in soil and vegetation, contributing to climate change mitigation. This approach leverages methods such as regenerative agriculture, agroforestry, cover cropping, and no-till farming, all of which enhance soil organic matter and improve carbon sequestration. By restoring degraded lands, increasing biodiversity, and promoting healthier ecosystems, carbon farming offers both environmental and economic benefits.One of the core principles of carbon farming is improving soil health, which in turn enhances its capacity to store carbon. Healthy soils also increase water retention, reduce erosion, and promote more resilient crops, contributing to food security. Additionally, carbon farming practices can reduce greenhouse gas emissions from agricultural activities, further decreasing agriculture's carbon footprint.Carbon farming is becoming an essential part of climate policy discussions due to its potential to sequester large amounts of carbon. However, challenges remain, including establishing standardized measurement techniques for carbon sequestration and creating financial incentives for farmers. Carbon credits and government subsidies are emerging as possible solutions to incentivize adoption.As the global community strives to meet the goals of the Paris Agreement, carbon farming represents a promising avenue for carbon drawdown. It provides a nature-based solution to climate change, integrating sustainable agriculture with ecosystem services while benefiting farmers economically. Further research and policy support are needed to maximize its potential in mitigating global warming.

Paper ID: 136

Locust Bean Gum Crosslinked Psyllium husk Based Zirconium (IV) Aluminophosphate Nanoparticles for Photocatalytic and Antimicrobial Applications

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Abstract

The incorporation of plant extract onto inorganic moieties has gained interest in the scientific community because of their easy availability, reusability and biodegradability. The present study includes, synthesis of locust bean gum cl psyllium husk-based zirconium (IV) aluminophosphate (LBG-PSK@ZAPT) nanoparticles via the sol-gel method. LBG-PSK@ZAPT nanoparticles have been characterized using different techniques like X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier transform infrared spectroscopy (FTIR), energy dispersive X-ray analysis (EDX) and X-ray photoelectron spectroscopy (XPS). TEM analysis confirmed the formation of nano-sized particles. XRD analysis revealed the amorphous morphology of the LBG-PSK@ZAPT. The photocatalytic activity of the nanoparticles was evaluated for the degradation of diclofenac potassium under solar light. The results showed greater degradation activity by LBG-PSK@ZAPT as compared to ZAPT. Nanoparticles were tested for antimicrobial activity against *B. subtilis*, *S. aureus* and *E. coli* bacteria.

Paper ID: 137

The influence of substituents on the mutual induced-fit process drives the successful formation of hydrogen-bonded capsules.

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Abstract

Molecular cavities created by π-conjugated components often collapse in the absence of guest molecules, particularly in solution, due to strong π•••π interactions between the elements. Recently, we investigated how the mutual induced-fit effect can address this challenge. In this report, we demonstrate how substituents influence the efficiency of the mutual induced-fit mechanism in an artificial system.

Paper ID: 138

Adsorption mechanism of Carbendazim from water system using *Azadirachta indica* bionanocomposite

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Abstract

Water pollution is a major environmental issue today, due to industrial activities and growing population. As population increases, consumption patterns shift for greater demands of resources. These factors combined with quick industrial expansion, result in heavy contamination of water sources. The consequences become threaten for aquatic ecosystems and put human health at risk. We need to alter these impacts for sustainable practices. Wastewater treatment not able to remove all of these pollutants, which shows there is need for additional processes to effectively remove contaminants. To resolve this issue, we using agriculture waste materials. The aim to reduce the waste production and able to provide a cost-efficient method for various applications. This approach promotes sustainability by turning waste materials into useful resources. Activated carbon prepared from seeds of *Azadirachta indica* (Neem). Physical activation for preparation of activated carbon. FTIR and FESEM techniques used to characterized activated carbon. Activated carbon's porous structure have ability to adsorb pollutants from water. Larger surface area allows better interaction with contaminants and trapping harmful substances in tiny pores of activated carbon. This causes activated carbon an important material for water treatment and purification. Batch experiment was conducted for studying the effect of various parameters on the adsorption of carbendazim (fungicide).

Paper ID: 139

Green Fabrication of Biochar-Supported Aluminum and Cerium Oxide Nano hybrid structure for environmental detoxification

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Abstract

This paper aims to synthesize green aluminum Al_2O_3 and CeO_2 nanocomposites supported on biochar obtained by the reducing and stabilizing agent *Hibiscus rosa-sinensis* leaf extract. This plant-based approach provides a new, cost-effective route for synthesizing nanocomposites without using toxic chemicals most used in the conventional synthesis process. Calcination of Al_2O_3/CeO_2 nanocomposites within a biochar support at different temperatures was also considered in terms of the optimization of physicochemical properties with emphasis on the removal of contaminants in wastewater. Calcination, in itself, has a considerable effect on crystallinity, surface area, and porosity, which are critical factors in terms of adsorption and catalytic performance. Characterization techniques, including XRD, SEM, FTIR, VSM, TGA, EDX, TEM and BET, were employed in this research work to understand the structural and morphological features arising due to the variation in temperature of the nanocomposite system. Such types of nanocomposites were developed to explore the removal mechanisms for major pollutants, particularly nitrates, phosphates, and heavy metals via adsorption and photocatalytic degradation mechanisms. Results depict that calcination temperature is a critical factor as high temperatures can be able to assist in improving the crystallinity and the surface activity of such nanomaterials, thus playing a significant role in determining the efficiency of the product. This greener synthesis route offers a pathway toward environmental remediation by the production at nanomaterials in a sustainable manner, thus offering promise in the treatment applications of wastewater.

Paper ID: 140

Fabrication of biochar/Fe/Zn-Al layered double hydroxide nanohybrid for the amputation of arsenic (v) from industrial effluent

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Abstract

Excessive heavy pollutants has contaminated the ecosystem and it is challenging to effectively remove pollutant from aqueous system. In the present work, magnetic Zn-Al layered double hydroxides is synthesized via co-precipitation method for the adsorption of arsenic in aqueous solution. The successful synthesis of magnetic zinc aluminum layered double hydroxide is characterized by a series of testing methods. The batch experiments are conducted to investigate the effect of various adsorption parameters on adsorption capacity of arsenic by magnetic Zn-Al layered double hydroxide, such as ldh dosage, solution pH and so on. Further adsorption studies, kinetics, isotherm, and thermodynamic were performed to explore the adsorption behavior of sodium arsenate on magnetic zinc aluminium hydroxide layered double hydroxide. Adsorption kinetics followed the pseudo second order model. The electrostatic attraction, hydrogen bonding, molecular intercalation mainly occurred during the adsorption process. In conclude, magnetic Zn-Al layered double hydroxides might be a potential adsorbent for the purification of wastewater containing heavy metals.

Paper ID: 141

Lower Rim Functionalization in Resorcin[4]arene Derivatives: Supramolecular Liquid crystals for controlled self-assembly

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Abstract

Researchers' attention has recently been drawn to the design and synthesis of useful supramolecular compounds that have the potential to self-assemble and stabilize mesogenic characteristics.[1] These compounds are very interesting from a technological standpoint.[2] They become useful in the fabrication of various devices like OLED, organic photovoltaic cells, organic field-effect transistors, gas sensors, and organic solar cell applications.[3] Here, bowl-shaped supramolecular mesogens based on resorcin[4]arene with octa-substituted alkyl arms were synthesized using a straightforward two-step procedure. The display of the materials mesogenic behavior is affected differently when an alkoxy tail group is added at their peripheries. The liquid crystalline characteristics and molecular self-assembly type behavior of these functionalized supramolecular compounds were studied. The lower alkyl-arm substituted supramolecules show SmC-type mesogenic properties, while higher alkyl-arm substituted compounds display columnar hexagonal-type mesogenic properties. This research suggests that the calix [4]resorcinarene core is a better candidate to fabricate supramolecular materials to achieve liquid crystalline properties with higher thermal stability. Different techniques like FT-IR, CHN analysis, ^{1}H NMR, ^{13}C NMR, and MALDI-TOF have attained the structural conformation and characterization of resorcinarene-based materials.

Paper ID: 142

Cyclotriaguaicyclene-based integrated supramolecular materials for liquid crystals and self-assembly behavior

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Abstract

Nowadays, Researchers are increasingly focusing on developing light-emitting liquid crystalline compounds derived from supramolecular materials. An advanced tri-substituted supramolecular material was synthesized via the conversion of cyclotriveratrylene to cyclotriguaiacyclene with further esterification reaction with fluorescein unit embedded with side arms. These supramolecular materials were prepared in good yield and further confirmed by using FT-IR, ^{1}H-NMR, ^{13}C-NMR, and MALDI-TOF. All four luminescent materials exhibited columnar hexagonal-type mesophase in heating and cooling conditions. The materials with hexadecyloxy and octadecyloxy tail group exhibit liquid crystalline behavior at room temperature indicating the presence of a mesophase even under ambient conditions. The thermal behaviors and optical textures were identified by using DSC and POM study and the molecular packing arrangement in the mesogenic state was checked by high temperature XRD study.The CTG core, with its highly fluorescent nature and columnar hexagonal self-assembly, is ideal for device applications due to its superior thermal stability. The photophysical and computational study provides the importance of the optical and electronic nature of the compounds.

Paper ID: 143

Electro-induced Synthesis of Pyrazolo[5,1-*b*]quinazoline-3-carboxylates: Potent Inhibitors Against Antiproliferative Activity

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Abstract

Nitrogen-containing compounds have long been a focus in chemistry due to their crucial role in medicine and pharmaceuticals. Many biologically active molecules, such as pyrazole, pyrimidine, quinazoline, triazole, and pyridine, feature nitrogen-rich five- and six-membered heterocyclic structures, which are pivotal in various applications. Among these, pyrazole and quinazoline frameworks are particularly noteworthy for their biological significance, demonstrating activities like anti-inflammatory, antitumor, antihyperglycemic, and CNS effects. Herein, an electrochemical approach was implemented to synthesize pyrazolo[5,1-b]quinazoline-3-carboxylates (**PQCs**) by reacting ethyl 3-amino-1*H*-pyrazole-4-carboxylate with various aldehydes and 1,3-cyclohexanediones in presence of acid catalyst. The synthesis of PQCs was carried out under ambient conditions using an undivided electrochemical cell with stainless-steel electrodes functioning as both the anode and cathode. This electrochemical protocol proceeded smoothly, resulting in the target compounds with good to excellent yields. All the synthesized PQC derivatives were characterized using various analytical tools such as ^{1}H NMR, ^{13}C NMR, and mass spectrometry. To expand the pharmaceutical eminence, all the PQCs were evaluated for *in vitro* study against six different human tumor cell lines (A549, SW1573, HBL-100, T-47D, HeLa, and WiDr). Most of the PQCs showed good GI_{50} value and few PQCs showed superior antiproliferative activity (GI_{50} < 10 µM).

Paper ID: 144

DIPEA-PTS Mediated Synthesis of Pharmacologically Relevant Pyrazolo-Quinolines: A Green Perspective

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Abstract

Heterocyclic compounds are integral to organic chemistry, serving as vital components inmedicinal chemistry, materials science, and agriculture. Their presence in macromolecules such as enzymes, vitamins, and biologically active compounds underscores their significance. These compounds form the backbone of numerous therapeutic agents in the pharmaceutical industry. Among these, pyrazolo-quinoline derivatives are particularly noteworthy for their potent anticancer and antioxidant activities. These compounds interact with biological targets to inhibit DNA synthesis, promote oxidative stress, and induce apoptosis in cancer cells, making them promising candidates for novel cancer therapies. Green chemistry principles, which emphasize the reduction of hazardous substances and the development of sustainable processes, are increasingly crucial. Multicomponent reactions (MCRs) and ionic liquids (ILs) are critical strategies for advancing sustainable chemical processes. MCRs reduce the number of synthetic steps and overall reaction time, contributing to more environmentally friendly practices. ILs, with their low volatility and recyclability, offer a promising alternative to traditional organic solvents and significantly reduce volatile organic compound (VOC) emissions. In line of our research interest in development of new biologically relevant pyrazolone-based scaffolds using greener conditions, herein we report the synthesis of novel pyrazolo-quinoline derivatives using diisopropyl ethyl ammonium p-toluene sulfonate (DIPEA-PTS) IL as both a solvent and catalyst. Mild reaction conditions, broad substrate scope, short reaction time, no column chromatography, good to excellent yields, large-scale synthetic applicability, reusability of reaction media, high atom-economy and low E-factors are the key findings of this protocol. Further their in vivo antiproliferative studies on six cancer cell lines revealed promising antiproliferative activity.

Paper ID: 145

An Extensive study of Titanium Complexes as Cytotoxic Agents

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Abstract

The first metal based drug was cis-platin which was found effective against various types of cancer. After cis-platin, titanium based drugs (titanocne dichloride and budotitane) entered into clinical trials. These two kinds of complexes were effective against those cancer cell lines that are resistant to cis-platin and other platinum-based drugs, particularly gastro intestinal tract cancer cell lines. But, these compounds' primary drawback is their poor hydrolytic stability. Following these two classes, diaminebis(phenolato)bis(alkoxo) titanium(IV), a third generation titanium based complex, was developed. This complex demonstrated higher hydrolytic stability and more cytotoxicity compared to budotitane and titanocene dichloride. Also, it has been observed that cytotoxicity is significantly influenced by a complex's hydrolytic stability. Other studies have demonstrated that complexes that are hydrolytically less stable break down quickly into non-bioavailable moieties and become inactive. The mechanism of Ti(IV) complexes of diaminebis(phenolato)bis(alkoxo) is under study and is thought to involve endoplasmic reticulum (ER) stress, which leads to apoptosis. According to the suggested mechanism, the titanium complex's ligands are to be removed, and the Ti center binds to transferrin protein before being released inside the cell. Furthermore, the bulkiness of the ligand has an effect on the cytotoxicity of complexes; complex cytotoxicity decreased as ligand bulkiness is increased. In previous studies it has been observed that several factors which play a key role in cytotoxic activity are steric and electronic factors such as bulkiness, symmetry, orientation, polarity, and the aromatic nature of the ligand.

Paper ID: 146

Synthesis and characterization of novel zirconium incorporated pectin-based citric acid crosslinked nanoparticles

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Abstract

Nanoparticles are the most versatile tools in the hands of the modern-day researchers. These entities with high surface area are excellent candidates for use in biomedical and other applications. The present work focuses on synthesis of novel Zirconium incorporated pectin based citric acid crosslinked nanoparticles following sol-gel method under ultrasonication at 75ºC.The synthesized pale-yellow nanoparticles were characterized by Fourier transform infrared spectroscopy, particle size analysis and FESEM. The results supported the synthesis of particles of size below 100nm and successful Zirconium incorporation into the polymer matrix. These nanoparticles are potential candidates for antimicrobial and hard metal sorption studies. Moreover, the incessant increase in air, water and soil pollution is putting a lot of stress on the overall flora and fauna well-being. There is a need to look for an alternative for easy removal of harmful pollutants such as heavy metal ions from the environment. The use for biopolymers for the nanoparticle synthesises is the latest filed of research. Due to their distinct physicochemical characteristics, nano-adsorbents have proven to be highly effective in removing heavy metal ions from water. This makes them a promising solution for capturing metal ions. Various types of nano-adsorbents, including magnetic nanoparticles (MNPs) and nanofiber materials, have been extensively.

Paper ID: 147

Enhanced adsorption of Noxious metals Cr (VI) and As (III) from water using biochar derived from *Syzygium cumini* seeds and its Lanthanum ferrite nanocomposite (SCB/NC)

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Abstract

In this study Biochar derived from *Syzygium cumini* seed (SCB) and its lanthanum ferrite nanocomposite (SCB/NC) was explored for Cr (VI) and AS (III) removal from water. The nature, surface composition, and functionality of a synthetic nanocomposite were ascertained using the FTIR, XRD, FESEM, BET, EDX, and XPS techniques. The anticipated average crystallographic size was observed in the range from 5 nm to 9 nm. Batch experiments were carried out to examine the adsorption kinetics, equilibrium isotherms, and thermodynamic characteristics. Under a variety of conditions, including adsorbent dosage, initial adsorbate concentration, the impact of pH, temperature, and agitation time, the potential of SCB/NC for Cr (VI) and As (III) adsorption was examined. Approximately 98.58 % of the Cr (VI) and 94.16 % of As (III) was adsorbed during the process between pH 2.0 - 6.0 at 65 °C. Kinetic studies indicated the pseudo second order reaction for the removal of dye from water. The adsorption isotherm strongly followed the Langmuir model (R^2=0.99), with a maximum adsorption capacity of 177 mg g^{-1} for Cr (VI) and 162 mg g^{-1} for As (III) mg/g. The adsorbent's adsorption capability can be barely diminished after up to five reuses.

Paper ID: 148

Synthesis and Biomedical Applications of *Zea mays*-Based Polyurethane Sponge with pH Responsive Behaviour

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Abstract

In this research, a novel flexible polyurethane sponge matrix was synthesized using whole grain *Zea mays* (corn) as a bio-based polyol and methylene diphenyl diisocyanate (MDI) as the isocyanate component. The synthesis process involved the reaction of *Zea mays*-derived polyol with MDI to produce a polyurethane sponge, characterized extensively through Fourier transform infrared spectroscopy (FTIR) to confirm the successful incorporation of both components and the formation of the polyurethane network. The sponge matrix was then evaluated for its swelling behaviour across a range of pH conditions (1.2, 4.0, 6.8, and 9.2). Results indicated significant swelling in both acidic and basic media, while minimal swelling and degradation were observed under neutral conditions. This behaviour suggests that the sponge's chemical structure responds sensitively to pH variations, likely due to the ionizable groups introduced by the bio-based polyol. Additionally, the material demonstrated notable blood compatibility and antioxidant activity, making it a promising candidate for biomedical applications. These findings highlight the potential of using agricultural by-products in creating functional and eco-friendly polyurethane materials with desirable properties for various applications.

Paper ID: 149

Facile synthesis of biowaste-derived n-doped graphene quantum dots for the detection of carcinogenic Cr (VI), organic pollutant 4-nitro phenol and fluorescent ink

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Abstract

In recent years, the development of bio-waste derived sustainable and green carbon quantum dots (QDs) with wide range of applications, is a fascinating and environment friendly approach to overcome the limitation of chemical synthesis techniques. Among them, Graphene Quantum Dots (GQDs) have emerged as a rising star in the field of nanomaterials due to their facile low-cost synthesis, non-toxicity, biocompatibility, water solubility and highly tunable photoluminescence properties making them promising next generation sensing materials. In the present work, we have demonstrated the synthesis of domestic biowaste *Cajanus Cajan pods* derived GQDs *via* green and simple pyrolysis route. Further, we have blended *Cajanus Cajan pods* with Urea as nitrogen source to prepare nitrogen doped GQDs with ratios of 1:1 (N_1-GQDs) and 1:2 (N_2-GQDs). Here, doping of nitrogen allowed more active sites on the surface of GQDs causing large-bathochromic shift in the emission peak resulting in tremendous enhancement of luminescent properties of N_2-GQDs. The resultant N_2-GQDs exhibited bright blue photoluminescence in the range of 300 to 450 nm, corresponding to relative photoluminescence quantum yield (PLQY) of 12.58%. All GQDs were characterized using Fluorescence spectroscopy, UV-Visible spectroscopy, FT-IR spectroscopy, and Elemental analysis. The structural and phase properties of N_2-GQDs were explored by powder XRD analysis. The crystalline nature, hexagonal graphene sheet-like arrangement and 2-8 nm size of N_2-GQDs were deduced from HR-TEM and SAED pattern. The synthesized N_2-GQDs showed significant stability over a long time. Further, N_2-GQDs were utilized for selective sensing of carcinogenic Cr(VI) metal, and organic pollutant 4-Nitro phenol. N_2-GQDs were also used as fluorescent ink without any chemical alteration. The material developed in this study could be a promising candidate for the development of bio-waste derived emerging materials.

Paper ID: 150

Impact of Cobalt-Methionine Complex on Growth Parameters of Maize Seedlings

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Abstract

The current study evaluates the role of cobalt (Co) in seedling growth and development for maize. Cobalt methionine, synthesized by refluxing cobalt nitrate hexahydrate with methionine at 30 °C, was characterized using P-XRD and FTIR techniques. Different growth parameters (seed weight, fresh plant weight, plant length, root length, and shoot length) were analyzed after 12 and 24 hours of treatment with varying concentrations (v/v ranging from 0.1% to 0.0001%) of cobalt methionine and cobalt nitrate hexahydrate on maize seeds. In the 12-hour treatment, cobalt methionine at a 0.001% concentration had the highest overall plant length (14.9 cm), while the 0.05% concentration produced the longest shoot length (9.1 cm). In contrast, cobalt nitrate hexahydrate at 0.05% resulted in the best plant length (17.6 cm). For the 24-hour treatments, cobalt methionine at 0.0001% and cobalt nitrate hexahydrate at 0.01% showed the most notable increases in plant weight and shoot length, respectively. This investigation demonstrates that cobalt methionine and cobalt nitrate hexahydrate exhibit different efficiencies in promoting plant growth. Cobalt methionine at lower concentrations (0.001% and 0.005%) promotes better growth in the short term (12 hours), while cobalt nitrate hexahydrate at a 0.01% concentration is more effective over a longer period (24 hours). These results indicate that the performance of cobalt-based treatments depends on both concentration and duration of exposure.

Paper ID: 151

Design and Fabrication of Zn (II) metallogel: Scaffold for Stabilize Ag Nanocomposite and Use for Sunlight Mediated Reduction of Nitro Compounds

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Abstract

A novel Zn(II) based supramolecular metallogel [Zn(II)MA-MG] has been synthesized using malonic acid as a low molecular weight gelator (LMWG). The mechanical property of [Zn(II)MA-MG] has been studied through rheological investigations. The structure, composition, crystalline nature and thermal stability of xerogel of Zn(II)MA-MG have been explored through Single Crystal X-ray Diffraction, FT-IR spectroscopy, Powder XRD, Mass spectrometry, Energy Dispersive X-Ray analysis and Thermogravimetric analysis. The FESEM microstructural study reveals the hierarchical morphology with self-assembled architecture. The metallogel has been utilized as a template for the synthesis of bimetallic nanocomposite with silver [Zn(II)MA@Ag] and it is proven to be an excellent scaffold to stabilize silver nanoparticles in its network structure forming a bimetallic nanocomposite. This is the first example of LMWG based metallogel being stable scaffold to reduce and stabilize nanoparticles. The synthesized nanocomposite has shown good catalytic reduction property for nitro derivatives.

Paper ID: 152

Base-Free and Acceptor-Less Double Dehydrogenation of Primary Amines to Nitriles using Robust Tetrazole-Linked Bimetallic Ru(II) Complexes under Milder Conditions

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Abstract

The catalytic double dehydrogenation (DDH) of primary amines is a clean and efficient method over aerobic oxidation. Further, the utilization of bimetallic catalytic system for DDH has proven to be more efficient than its monometallic counterpart. However, its large scale adoption for industrial application is limited owing to the usage of expensive and environmentally adverse catalytic conditions. In this context, the present study describes the first example of tetrazole-derived two bimetallic Ru(II)-arene complexes [(η^6-*p*-cymene)$_2$Ru$_2$Cl$_3$(L1)] **[Ru-1]** and [(η^6-benzene)$_2$Ru$_2$Cl$_3$(L1)] **[Ru-2]** (where, L1 = 4-(1H-tetrazole-5yl) benzoic acid) for acceptor-less double dehydrogenation of primary amines under oxidant and base free conditions. The results suggest that the electron rich **[Ru-1]** has outperformed due to its high solubility, high electron density and more charge separation as compared to **[Ru-2]**. The mechanistic studies reveal that electrophilic centre of **[Ru-1]** easily associates with substrate, whereas nucleophilic metal centre abstracts β-hydrogen of primary amine *via* thermodynamically more favourable six-membered transition state as compared to traditional four membered transition state in monometallic system. Further, the catalytic investigation proves that electron rich aromatic primary amines and aliphatic amines are more powerful than bidentate substrates which deactivate the catalyst suggesting the bimetallic dehydrogenation pathway for primary amines. Overall, this research opens the possibility of exploring tetrazole linked bimetallic complexes as an industry efficient solution for transition of primary amines to nitriles.

Paper ID: 153

Catalysts in biodiesel production via esterification/trans-esterification of vegetable oils: A review

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Abstract

Biodiesel is a sustainable and requisite fuel for today's needs. As biodiesel is an eco-friendly and under-budget fuel, it is in high demand. Numerous studies have been performed to produce biodiesel using a variety of catalysts. There are three types of catalysts used for biodiesel production viz; biocatalysts, homogeneous and heterogeneous catalysts including subcategories; Enzyme, Acid and Base. A catalyst has been considered the best that possesses the following characteristics: large surface area, long life span, Keggin structure, quantitative % yield, etc. Biodiesel production can be done either through transesterification or esterification process. The previously performed studies indicated their best outputs regarding biodiesel production. In this review, we have tried to analyze the use of several catalysts using a variety of reactants viz; vegetable and animal oil with alcohols through transesterification and esterification process for biodiesel production.

Paper ID: 154

Development of Agro waste derived Cellulose and Collagen based ecofriendly biosorbent for removal of Uranium from contaminated water

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Abstract

This study focuses on the removal of radioactive uranium ions from contaminated water using biosorbents made from agricultural waste-derived cellulose combined with collagen. Agricultural waste, being abundant and cost-effective, provides an eco-friendly source of cellulose, while collagen enhances the adsorptive properties due to its functional groups. The resulting biosorbent exhibits strong binding affinities for uranium ions, offering a sustainable solution to water contamination. The study examines the adsorption capacity of the cellulose-collagen based adsorbent under different pH level, contact time, adsorbent dose and uranium concentration to optimize performance. Additionally, the recyclability and regeneration potential of the adsorbent are explored, emphasizing its cost-effectiveness and environmental benefits. By integrating waste materials into a biodegradable and renewable adsorbent, this research highlights a promising approach to mitigating radioactive pollution in water, with significant implications for water purification and environmental protection.

Paper ID: 155

Biowaste-Derived Pectin-Nanocellulose Hybrid Backbone-Based Semi-Interpenetrating Network for Efficient Oil-Water Separation

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Abstract

This study focuses on the synthesis of semi-interpenetrating polymer network (semi-IPN) using orange peel-extracted pectin and wheat straw-extracted nanocellulose, aiming to develop an eco-friendly material for the separation of oil-water emulsions. By utilizing agricultural waste, the process offers a sustainable approach to material synthesis. The semi-IPN was fabricated through 'waste-to-wealth' approach, and its physicochemical properties were extensively analyzed using techniques such as FTIR, TGA, SEM, and XRD. Key properties including thermal stability, swelling capacity and surface morphology, were investigated to assess its potential as an efficient adsorbent for oil water emulsion. The material's performance in separating water from oil-water emulsions was evaluated, demonstrating high efficiency in water purification. The results highlight the ability of the semi-IPN to act as a promising bio-based solution for environmental applications, particularly in the remediation of oil-contaminated water. This work offers a significant step toward the development of sustainable materials for wastewater treatment and environmental protection.

Paper ID: 156

Photocatalytic Degradation of Toxic Phenolic Compounds Using N-doped Nickel Oxide-Zeolite Nanocomposites under Sunlight Irradiation

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Abstract

Nanotechnology is an innovative technique that utilizes nanoparticles and nanocomposites to eliminate hazardous pollutants. Nanoparticles synthesized with plant extracts are noticeably more stable and biocompatible than those synthesized using typical chemical and physical methods. This study investigates the green synthesis of the N-NiO@Zeolite nanocomposite utilizing *Camellia sinensis* (green tea) leaf extract. The nanocomposite was used to photocatalyzed the degradation of toxic organic pollutants such as 3-Aminophenol (3-AP) and bisphenol A (BPA) using sunlight irradiation. The modified nanomaterials exhibited excellent photocatalytic activity, degrading 3-AP and BPA. Optimal conditions for degradation were pollutant concentrations of 10 mg L^{-1} for 3-AP and 4 mg L^{-1} for BPA, photocatalyst dosages of 15 mg for 3-AP and 10 mg for BPA, and neutral pH for both. Within 120 minutes, the N-NiO@zeolite nanocomposite achieved degradation efficiencies of 96% for 3-AP and 94% for BPA, outperforming its parental materials, N-NiO (78% for 3-AP and 75% for BPA) and NiO (66% for 3-AP and 65% for BPA). The degradation followed first-order kinetics and the Langmuir-Hinshelwood model, aligning with the Langmuir adsorption isotherm. Additionally, the N-NiO@Zeolite nanocomposite showed excellent durability and reusability, maintaining its efficiency after 10 cycles of reuse, with its stability confirmed by PXRD analysis. These potentials make the nanocomposite a promising long-term resolution for wastewater treatment.

Paper ID: 157

Photocatalytic Conversion of Nitroarenes into Valuable Scaffolds

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Abstract

The reduction of nitro group-containing compounds to their corresponding amines is a crucial organic transformation with broad applications in the pharmaceutical, agrochemical, and environmental sectors. Traditional approaches to this process typically involved toxic reagents, hazardous solvents, complex methodologies, and harsh reaction conditions. Moreover, achieving selectivity was a major challenge due to the formation of stable intermediates. Nitro compounds are also recognized as significant environmental pollutants, frequently found in industrial waste, agricultural runoff, and even human excreta. Simply degrading these molecules may remove them from the environment, but selective reduction offers the added advantage of generating valuable functional groups that can be used to produce industrially relevant scaffolds. Hence, there is an urgent need for sustainable, efficient, and cost-effective methods. The advent of photocatalytic processes has opened new avenues in organic synthesis, catalysis, and environmental remediation, enabling the adoption of cleaner, greener, and more energy-efficient methods for nitro compound reduction. These processes facilitate the production of target compounds with high regio- and chemo-selectivity, providing valuable building blocks for synthesizing industrially important molecules

Paper ID: 158/159

An improved LC-MS/MS Method to study the impacts on Podophyllotoxin concentrations in roots of *Podophyllum hexandrum* and yield enhancement

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Abstract

Podophyllum hexandrum a well-known medicinal plant, demonstrates numerous therapeutic effects due to the presence of podophyllotoxin especially in oncology. In this study, after development and validation of a RP-HPLC-MS method, levels of podophyllotoxin in root samples of this plant collected from north of Himalayas were measured and environmental factors affecting its content were investigated. Five plant populations from different spots of northern Himalayas were collected, and concentration levels of podophyllotoxin were measured applying a validated High Performance Liquid Chromatography- Diode Array Detector/Mass Spectrometry (HPLC-DAD/MS) method. The impact of geographical parameters encompassing altitude and average temperature on podophyllotoxin contents was assessed. The validated method was selective, with good resolution, excellent linearity ($r^2 >$ 0.9997), high accuracy, sensitivity and precision. The results illustrated that there was a direct correlation between altitude with the content of podophyllotoxin in plant, which means that more the altitude, the more the content of podophyllotoxin. In an opposite manner, levels of the podophyllotoxin reversely correlated with the average temperature, in a way that decreasing this variable resulted in raising the amount of the podophyllotoxin. Treatments of cultured cells with fungal elicitors have been shown to induce the phenylpropanoid biosynthetic pathways and elicitors methyl jasmonate at 15 µM after 4 days resulted in higher HPLC content 8.606 % and of isosafrole at 10 µM after 8 days shows 5.344%.

Paper ID: 160

Synthesis, characterization and *in vitro* biological evaluation of new indole appended dibenzo[*b,e*][1,4]diazepin-1-ones

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Abstract

This paper demonstrates a method for the reaction of indole-3-carbaldehyde, *O*-phenylene diamine, and dimedone in the presence of glacial acetic acid in dry ethanol at room temperature, resulting in the formation of new indole-appended diazepine heterocycles. The method is highly efficient, with the desired products obtained in the 60-70% yield range, and does not require chromatography. All newly synthesized heterocycles are characterized by mass, ^{1}H NMR, ^{13}C NMR, and ^{19}F NMR data. The proposed structures are confirmed by the single-crystal X-ray diffraction data. NMR data and the MEP diagram confirmed the regioselectivity of N-allylation of indolyl-dibenzo[b,e][1,4]diazepin-1-one. All heterocycles have been screened *in-silico* for their ADME profile and *in-vitro* for their antiproliferative and antimicrobial activities. The *in-vitro* screening showed promising results, further underscoring the potential of our research.

Paper ID: 161

A new domino/knoevenagel-michael- dehydrative-cyclization as a green synthetic approach to novel pyrazole-appended xanthene diones in ethylene glycol

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Abstract

Xanthene compounds are structures that contain a pyran ring. They are found in both natural products and synthetic compounds and are important due to their various biological activities, such as antimicrobial, antioxidant, anti-cancer, antimalarial, and anti-inflammatory properties. They have also been found to be effective against SARS-CoV-2 infections. Additionally, many compounds in this group are used as dyes and fluorescent materials, which help create probes for cell imaging. As a result, researchers have become increasingly interested in developing new chemical systems containing the xanthene core in the past decade.The present research work demonstrates a new and efficient synthetic approach, 'Knoevenagel-Michael-dehydrative cyclization' to synthesize new compounds, 9-(5-methyl-1-(allyl/prenyl/geranyl/methyl) -3-oxo-2-phenyl-pyrazol-4-yl)-1*H*- xanthene-1,8(2*H*)- diones. This approach combines 5-methyl-1-(allyl/prenyl/geranyl/methyl)-3-oxo-2- phenyl- pyrazole-4- carbaldehyde with dimedone/cyclohexane-1,3-dione in ethylene glycol at 110°C. The method is highly efficient, producing the desired compounds with higher yields in a shorter reaction time. Using ethylene glycol as a renewable feedstock makes the method environmentally friendly. Additionally, using metal-free chemical substances simplifies the workup process, reduces waste, and aligns with the current need for eco-friendly methodologies. The structures of the new compounds are confirmed using mass, ^{1}H NMR, ^{13}C NMR, and single-crystal X-ray data.

Paper ID: 162

Smart Designing of PP Mesh Surface for Infection-Resistant System in Human Healthcare

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Abstract

In recent years, the development of infection-resistant polymeric materials has become a significant area of research. These polymeric materials have emerged as one of the most fascinating domains in the healthcare system. Polypropylene (PP) has an eminence potential to be used as a biomaterial because of its physicochemical properties. However, the major limitation associated with PP is the lack of functionalities on its surface, which makes it difficult to functionalize. To overcome this issue, plasma grafting followed by bioactive nanogel immobilization seems to be a good alternative for the development of functional polypropylene. Thus, the current strategy entails activating the surface with plasma-grafting and then immobilizing biopolymer-based bioactive nanogel to make a bio-receptive surface. The influence of the plasma grafting conditions on the surface functionalization was investigated. The morphology of the functionalized mesh was evaluated using TEM, EDX and FE-SEM. The immobilized mesh exhibited strong antimicrobial behavior against both *Escherichia coli* and *Staphylococcus aureus,* which was performed using colony count method.

Paper ID: 163

Sunlight-Driven Photocatalytic Degradation of Water Pollutants Using Nitrogen-Doped Nickel Hexacyanoferrate Embedded in Guar Gum-Xanthan Gel

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Abstract

Herein, Nitrogen-doped nickel hexacyanoferrate (N@NiHCF) nanoparticles were synthesized via co-precipitation and incorporated into a guar gum (GG)-Xanthan gum (Xa) polymer matrix (GGXa@N@NiHCF) for efficient removal of rose bengal (RB) dye and nonyl phenol (NP) under sunlight. Relevant characterization techniques namely, PXRD, FESEM, XPS, and FTIR confirmed the successful integration of N@NiHCF into the GGXa matrix. Scherrer and Williamson-Hall methods estimated the average crystallite size to be 16.34 nm. Zeta potential values (-17.7 mV for N@NiHCF and -22.9 mV for GGXa@N@NiHCF) and TGA analysis affirmed structural stability. The N@NiHCF nanoparticles exhibited a band gap of 2.3 eV, enhancing photocatalytic activity through improved light absorption and charge separation. Under optimized conditions, photocatalytic degradation reached 91% for RB in 150 minutes and 95% for NP in 300 minutes. Kinetics studies using the Hinshelwood model yielded rate constants of 0.93 min^{-1} for RB and 0.60 min^{-1} for NP. LC-MS identified degradation pathways, while recyclability tests confirmed stable performance over multiple cycles, positioning GGXa@N@NiHCF as a sustainable solution for water pollutant remediation.

Paper ID: 164

Pesticides removal and their detection by green synthesized nanocomposites of biogenic quantum dots: A comprehensive review

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Abstract

The use of pesticides is crucial for enhancing agricultural productivity but they pose significant threats to the environment and human health due to their persistence and toxicity, necessitating effective monitoring and remediation strategies. This review delves into the application of green carbon quantum dots (CQDs) for sensitive pesticide detection and degradation. An analysis of the past decade's research reveals that sensors based on green CQDs have gained significant traction in pesticide sensing. For CQD-based nanocomposites in pesticide degradation, bismuth oxide-based nanocomposites have been primarily explored, indicating a need for further research with other metal-based nanocomposites. The principal findings demonstrate that CQD-based nanocomposites exhibit higher photocatalytic activity as CQDs act as charge carriers, possess up-conversion photoluminescence properties, and enhance photocatalyst stability. This review comprehensively discusses biomass-derived CQDs' synthesis techniques and characteristics and assesses their role in fluorescence sensing and photocatalytic degradation. By identifying key challenges and outlining future research directions, this review aims to inspire innovative solutions for mitigating pesticide pollution by developing sustainable CQD-based technologies.

Paper ID: 165

Fabrication of a dual z-scheme ag3po4/g-c3n4/bi2moo6 ternary nanocomposite for effective degradation of methylene blue dye

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Abstract

In this study, the photoactivity of Ag3PO4/g-C3N4/Bi2MoO6 (AP/GCN/BMO) photocatalyst was investigated for the degradation of MB dye from an aqueous system. g-C3N4, BMO and AP photocatalysts bare photocatalysts were synthesized via thermal polycondensation, hydrothermal and co-precipitation methods, respectively. Similarly, binary (GCN/BMO) and ternary heterojunctions (AP/GCN/BMO) was constructed through in-situ hydrothermal and co-precipitation methods, respectively. Morphological and structural analysis validated close interaction amongst Ag3PO4, g-C3N4, and Bi2MoO6 photocatalysts. Furthermore, density functional theory simulations were employed to explore the structural and electronic properties of the bare (Ag3PO4, g-C3N4, and Bi2MoO6) photocatalysts. The photocatalytic degradation experiments revealed that AP/GCN/BMO exhibited highest adsorption and photocatalytic degradation efficacy of methylene blue (MB) dye pollutant as compared to other photocatalysts. The achieved MB dye degradation efficiency of dual Z-scheme AP/GCN/BMO ternary photocatalyst was approx. ~94% within 60 min under visible light exposure which was much greater than pristine and binary photocatalysts. This higher efficiency was accredited to dual Z-scheme type of charge transfer route which boosted photocarriers charge separation and transferal rate. Furthermore, through scavenging experiment, the confirmed reactive species in this type of charge transfer route were $^{\bullet}O_2^-$ and $^{\bullet}OH$ radicals that efficiently degraded MB dye pollutant. Additionally, the ternary photocatalyst demonstrated good stability and recyclability for up to five successive catalytic cycles with 81% degradation efficiency. The current work extends our understanding of photocatalytic degradation by providing novel strategies for pollutant degradation that successfully break down contaminants. Also, it promotes the development of more efficient, environmentally friendly waste treatment methods that uses solar energy.

Paper ID: 166

Sensing and Photocatalytic Application of Greenly Synthesized Sm, Dy and Nd Doped ZnO Nanoparticles

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Abstract

This study focuses on the green synthesis of samarium (Sm), dysprosium (Dy), and neodymium (Nd) doped ZnO nanoparticles using *Rhododendron arboreum* petal extract. The nanoparticles were synthesized via a simple co-precipitation method and characterized by X-ray diffraction (XRD), high-resolution transmission electron microscopy (HRTEM), Fourier-transform infrared spectroscopy (FTIR), and UV-visible spectroscopy. XRD analysis provided insights into crystallite size and lattice parameters, while HRTEM confirmed the shape and size of the nanoparticles. UV-visible absorption studies revealed a successful narrowing of the band gap. These nanoparticles were then applied for the photocatalytic degradation of Novacron dyes. Additionally, the nanoparticles were used for sensing metformin hydrochloride, achieving a detection limit in the millimolar range.

Paper ID: 167

Designing of Bioreceptive Polypropylene for Biomedical Applications

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Abstract

Polypropylene (PP) is widely used due to its chemical resistance, non-toxicity, and high tensile strength. In spite of all these fascinating properties of PP, its surface inertness hinders its use in biomedical applications. Plasma technology is a surface-selective and sustainable approach which leads to the change in physiochemical properties and endows the specific features on the surface. Plasma functionalization of the PP was carried out for the development of a receptive surface that may be immobilized by a bioactive agent. Graft functionalization on plasma treated surfaces further offers an interesting route for creating a high density of desired groups on the surface. Itaconic Acid (IA) was grafted on the PP hernia mesh and the influence of polymerization parameters on the degree of grafting was investigated. The plasma grafting led to a shift in contact angle from 131° or virgin to 28° for 1.5 µg/cm^2 graft density. The bioactive nanogels of chitosan were used for the finishing of plasma-functionalized fabric and the results confirmed that nanogel finishing significantly improved the hydrophilicity, smoothness, and softness of the fabric surface. Surfaces exhibited strong antimicrobial nature against *S aureus* and *E coli*. It was observed that the modified surface has an excellent anti-adhesion nature against microbes, making it useful for the development of functional bioactive fabrics.

Paper ID: 168

Morphological Innovations in ZnO Nanoparticles for Efficient Environmental Remediation and Pollution Management

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Abstract

The need for inventive and effective remediation technologies arose from the growing pollution of the environment. Because of their distinctive physicochemical characteristics, which include high surface area, potent catalytic activity, and affordability, zinc oxide (ZnO) nanoparticles have become attractive options for the control of pollution. The goal of this research is to improve the environmental remediation and pollution management capabilities of ZnO nanoparticles by utilising their morphological innovations. This research demonstrates significant improvements in ZnO nanoparticles' photocatalytic efficiency for degrading organic pollutants and heavy metals from air, water, and soil by adjusting their shape, size, and surface characteristics (e.g., rods, spheres, flowers, and nanowires). In order to correlate the morphology of the synthesised nanoparticles with their environmental performance, they were characterised using X-ray diffraction (XRD), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). Important results demonstrate that under UV and visible light irradiation, certain morphologies of ZnO, especially those with high aspect ratios and exposed crystal planes, exhibit enhanced photocatalytic degradation of pollutants. Additionally, ZnO's environmental applications were further enhanced by doping it with transition metals, which increased catalytic efficiency by lowering charge carrier recombination rates. The study also looks into the possibility of using the nanoparticles to remove heavy metals from water, like lead and mercury, highlighting how versatile ZnO is for reducing pollution. These findings imply that morphological control of ZnO nanoparticles provides a reliable method for resolving environmental issues and opens the door for the development of next-generation remediation technologies.

Paper ID: 235

β-Oxodithioesters: Versatile Building Blocks for the Synthesis of Heterocycles via Multicomponent Reactions

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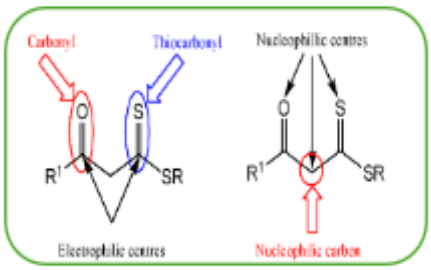
Abstract

Heterocyclic compounds are critical in the development of pharmaceuticals[1] and other materials[2], driving the demand for efficient synthetic methods[3]. Multicomponent reactions (MCRs) address this need by enabling the rapid assembly of complex products from three or more reactants, significantly reducing the reaction time, minimizing waste generation, and enhancing atom economy by incorporating all reactants into the final product in a single step[4]. β-Oxodithioesters, with both electrophilic and nucleophilic centers, act as versatile intermediates in multicomponent reactions (MCRs)[5]. Their dual reactivity facilitates the construction of diverse and complex heterocycles[6], paving the way for the development of novel compounds with potential applications in pharmaceuticals and drug discovery. Despite this, β-oxodithioesters remain underexplored, presenting significant opportunities for further research and development in synthesizing novel compounds.



Herein, we will discuss the reactivity and synthetic utility of β-oxodithioesters in the formation of various heterocycles by highlighting notable multicomponent reactions (MCRs) that successfully utilize β-Oxodithioester as a starting material.

Paper ID: 236

DFT Investigations of Novel RuVZ (Z=Sn/Ge) Half-Heusler Alloys for Energy Harvesting Applications

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Abstract

Half-Heusler (HH) alloys are promising materials for thermoelectric and energy harvesting applications due to their tunable electronic, thermal, and structural properties. In this study we have investigated the robust phase stability, elasto-mechanical, thermophysical and magnetic response of RbVZ (Z=Sn/Ge) half-Heusler compounds by implementing density functional theory (DFT) models in WIEN2k simulation package. The dynamic phase stability is computed in phase type I, II & III phase configurations by optimising their energy. It is observed that given compound is more stable in spin-polarized state of phase type-III. To explore the electronic band structure, we apply the generalised gradient approximation along with Hubbard potential U. The electronic band profile of the Heusler alloy display a half-metallic nature. Our DFT calculations reveal that RuVSn and RuVGe alloys adopt a stable cubic Half-Heusler structure, with optimized lattice parameters comparable to other known thermoelectric materials. The electronic band structure analysis shows that both alloys exhibit semiconducting behaviour, with band gaps in the range of 0.5–1.0 eV, suitable for thermoelectric applications. The projected density of states (DOS) indicates significant contributions from Ru and V d-orbitals, which influence the electronic transport properties. Moreover, the calculated second-order elastic parameters divulge the brittle nature. To understand the thermo-dynamical and thermoelectric stability of the alloy at various temperature and pressures ranges Quasi-Harmonic Debye model is executed successfully. The computed value of magnetic moment (MM) found in good agreement with Slater-Pauling rule. The study highlights the potential of RuVSn and RuVGe Half-Heusler alloys in thermoelectric generators and other energy conversion technologies. It will also focus on experimental validation, optimization of material properties through doping and nano-structuring, and the development of scalable synthesis methods. Our findings confirm that the predicted half Heusler alloy can be used in various energy harvesting applications and position these alloys as valuable materials for sustainable energy solutions.

Paper ID: 238

RGO based magnetic Light weight polymeric aerogel for the adsorption of Atrazine from simulated waste water

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Abstract

The research focuses on the development of a reduced graphene oxide (RGO)-based magnetic lightweight polymeric aerogel for the efficient adsorption of Atrazine from simulated wastewater. Atrazine, a widely used herbicide, poses significant environmental and public health risks due to its persistence in aquatic systems. The novel aerogel combines the high surface area and adsorption capabilities of RGO with the magnetic properties of iron oxide nanoparticles, enabling easy separation after adsorption. The lightweight polymeric matrix enhances the structural integrity and water treatment performance. Adsorption experiments demonstrate the aerogel's high capacity and reusability, offering a promising solution for removing hazardous organic pollutants from contaminated water sources.

Paper ID: 239

Synthesis, Swelling and Degradation Behaviour of CMC-Gelatin based Hydrogel for Biomedical Applications

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Abstract

A hydrogel composed of carboxymethyl cellulose (CMC) and gelatin was developed using glutaraldehyde as a crosslinker and boric acid as a binder. Different reaction parameters including crosslinker concentration, solvent volume, CMC: Gelatin ratio, binder concentration, pH were optimized to achieve rapid gelation. The hydrogel displayed a significant swelling capacity with a maximum swelling percentage of 5677% in 24 h. Swelling behaviour was further investigated across different pH levels and temperatures to determine optimal conditions. Degradation studies were conducted over a seven-day period at 37°C in various environments including phosphate buffers and urea solutions at multiple pH levels. These results suggest that the hydrogel's tuneable swelling, fast gelling time, and controlled degradation make it a promising candidate for biomedical applications such as wound healing, drug delivery, and tissue engineering. The optimized synthesis conditions and environmental stability underscore its potential utility in diversified field.

Paper ID: 240

Synthesis and Evaluation of Physicochemical Properties of Psyllium-Gum Ghatti based Hydrogel for Wastewater Remediation

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Abstract

The growing need for sustainable wastewater treatment has led to the development of innovative materials. This study introduces a hydrogel synthesized from psyllium gum and gum ghatti, with acetonitrile as the monomer, glutaraldehyde as the crosslinker, and ammonium persulfate as the initiator. Because of its improved adsorption capacity and mechanical robustness, the resultant hydrogel is useful for eliminating pollutants from wastewater. The synthesized hydrogel showed excellent % swelling (1700%) in 10 h. The material's effectiveness under various conditions was demonstrated by evaluating its physicochemical characteristics, such as swelling behavior and adsorption capability, at varied pH levels, temperatures and salt resistance behaviour w.r.t salt concentration. The hydrogel is a viable option for industrial wastewater treatment applications due to its great performance and environmentally benign nature. This material supports continuous efforts to enhance environmental sustainability in water management by providing an effective, sustainable solution.

Paper ID: 241

Fabrication of biosorbent from Biowaste & its application in Petroleum Industry

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Abstract

A new superabsorbent was developed by grafting polyvinyl alcohol onto a hybrid backbone of natural pectin and collagen, both sourced from biowaste (orange peels and fish collagen waste). Various reaction parameters were carefully optimized to achieve the product with the highest water absorption capacity. The water uptake capacity of the semi-interpenetrating polymer network (semi-IPN) was evaluated in three different petroleum fraction-water emulsions: petrol-water (2.9313 g/g), diesel-water (3.4834 g/g), and petroleum ether-water (1.8586 g/g). The highest water uptake was observed in the diesel-water emulsion compared to the petrol-water and petroleum ether-water emulsions. In all the petroleum fraction-water emulsions water penetration into the semi-IPN occurred through Fickian diffusion process. Thermogravimetric analysis (TGA) results showed that the thermal stability of the semi-IPN was significantly greater than that of pectin or collagen alone. These findings demonstrate the high potential of biowaste-derived superabsorbents for efficiently removing water from petroleum fractions, presenting a sustainable and energy-efficient method for oil-water separation in the petroleum industry.

Paper ID: 242

Fabrication and Characterization of Silk Fibroin – SericinHydrogels for Water Treatment and Bio- Application

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Abstract

Recently, the hydrogels of silk fibroin and sericin have tremendous potential for a variety of uses, especially in biomedical field and the treatment of water because of their functional qualities biocompatibility, biodegradability and adsorption capacity. Silk is mainly composed of silk fibroin and sericin. Silk fibroin (SF) and sericin both are excellent protein-based biomaterial produced by the degumming and purification of silk from cocoons of the *Bombyx mori* through alkali treatment. These polymeric hydrogels can be modified to enhance their ability for biomedical applications and to bind water contaminants. The researchers continue to explore innovative ways to improve extraction, fabrication methods and optimization strategies for silk fibroin and sericin hydrogels, including chemical crosslinking, and the development of hybrid materials. This review explores their different applications, from water remediation to regenrative medicine, highlighting their potential to address current challenges in these fields.

Paper ID: 243

Hydrogels as Eco-Friendly Adsorbents: A Solution for Industrial Wastewater Challenges

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Abstract

Wastewater treatment is a big concern globally because it is important to reduce pollutants from the environment at low cost. Industrial wastewater contains harmful contaminates like dyes, heavy metals, pesticide and other hazardous chemicals, which contaminate water resources. That is why it important to find new technologies to prevent these pollutants from being released into nature. Adsorption is a simple and cost-effective method for cleaning contaminated water, and a wide range of materials can be used as adsorbents to remove harmful compounds. Hydrogels are one such material, known for their high adsorption capacity to adsorb pollutants. These materials can be synthesized through environmentally friendly methods and show promise for large-scale water treatment in industries. However, there are still challenges in making them commercially sustainable. This review discusses how hydrogels are made, their properties, and how well they work in removing various pollutants from water. It also covers recent developments in improving hydrogels and creating new composite materials. High adsorption capacity of hydrogel makes them more effective than many other materials currently used for water purification. This review also explains how hydrogels interact with pollutants, helping us understand how they remove contaminants.

Paper ID: 244

Physicochemical and UV-absorption analysis of Interactions between Hydralazine Hydrochloride and Dextrose in Aqueous Solutions

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Abstract

Hydralazine hydrochloride is an antihypertensive drug prescribed to reduce high blood pressure during heart failure and pregnancy. To analyse and interpret the interactions between the hydralazine hydrochloride (HHC) and dextrose in aqueous medium, the densities () and sound velocities (u) values have been systematically recorded with an equal interval of 5K at four different temperatures (*T*/K= 300.15-315.15). The experimentally measured data were then used to calculate apparent molar (V, K), partial molar (V0, K0) and transfer (ΔtrV0, ΔtrK0) parameters. The effect of temperature and concentration on these parameters have been analysed to enhance the understanding of various predominant molecular interactions in the studied drug-solvent system. Furthermore, Hepler's, equation has been used to establish the structural-(making/breaking) behaviour of the drug HHC. UV-absorption spectral studies have also been carried out to validate the physicochemical results.

Paper ID: 245

Revolutionizing Packaging Sustainability: Biodegradable Coatings with Food Waste Essential Oils

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Abstract

Packaging plays a critical role in mitigating food losses by extending shelf life and maintaining product quality. However, conventional plastic packaging poses significant environmental challenges due to its non-biodegradable nature and potential inclusion of harmful chemicals. Consequently, the global shift towards sustainable packaging solutions that has led to innovative approaches in the utilization of biodegradable materials Biodegradable coatings derived from natural sources offer promising properties for food packaging applications. Moreover, the vast quantities of global food waste present an opportunity for resource utilization, particularly in extracting essential oils (EOs). Incorporating these EOs into various coating materials enhances their functional properties, improving food preservation. This review explores the potential of EOs derived from food waste as bioactive compounds in biodegradable coatings to enhance food storage quality and shelf life. These coatings mitigate microbial spoilage, prevent moisture loss, and act as gas barriers, thereby enhancing product shelf life. Additionally, they stabilize various food parameters such as pH, color, acidity, and firmness, reducing weight loss. Various packaging systems utilizing waste-derived EOs have been developed for preserving both plant and animal-based foods. Developing biodegradable packaging from natural polymers and incorporating EOs from food waste represents an innovative approach to food preservation and waste management. This review explores the potential of biodegradable coatings incorporating essential oils derived from food waste in revolutionizing packaging sustainability. We examine recent research findings on the properties and applications of such coatings, focusing on their role in extending the shelf life of various food products while reducing environmental impact. Key studies investigating the efficacy, safety, and consumer perception of these coatings are discussed, highlighting their significant contributions to advancing sustainable packaging practices in the food industry.

Paper ID: 274

Determination of Fungicidal Activities of some new Derivatives of N-[4-phenylOxazolyl]-3- Chloro- 4-[3'-iodo-4'-hydroxy-5'-ethoxy]-2'-azetidinones

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Abstract

The present study was conducted to evaluate the fungicidal activity, many phenols and compounds with phenolic groups have antifungal potency A large number of fungicides are formulated as wettable powders; this is the form most commonly used for spray mixes. They simply inhibit fungus growth temporarily.If the fungus is freed from such substance, it would revive. Such a chemical is called a ‘’fungistat” and the phenomenon of temporarily inhibiting the growth is ‘’fungistasis.. Some other chemicals, like certain phenanthrene derivatives and Bordeaux mixture, may inhibit spore production without affecting the growth of vegetative fungistate hyphae. 2-amino 4- Phenyl Oxazole is condensed with appropriate ethanol and piperidine aromatic was refluxed on water bath for 1 hr.Various. obtaining gave benzal imine and azetidinones respectively and synthesized compounds Most compounds investigated exhibited significant antifungal activity against *Fusarium solani* to that of Bavistin, the standard used drugs.

ENVIRONMENTAL

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EARTH SCIENCES

PAPER ID-175

Chromatographic Analysis of Additives in Plastic Debris and Their Removal by Metal Hexacyanoferrates

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Abstract

Plastic and their fragments are major component of land and marine debris globally. Among the plastic additives, brominated flame retardants (BFRs) used for making plastic flame proof have potential of endocrine disruption and suspected of causing adverse effects. Plastic additives are prone to leach out from products during the manufacturing process, application, after disposal, or recycling facilities and transfer to surrounding environments and organisms. To evaluate their role as vectors of chemical contaminants in environment, plastic debris (n = 35) from different classes (food contact, beverage, and general packing) were analyzed through GC-MS. A database on the presence of different chemicals were grouped into hydrocarbons, ultra-violet (UV)-stabilizers, antioxidants, plasticizers, lubricants, intermediates, compounds for dyes and inks, flame retardants, etc. The comparison between new and debris plastics clearly indicated the leaching and absorption of chemicals. Based on finding TBBPA and ATE were selected for photodegradation study by green synthesized NiO@CuHCF nanohybrids. In 120 minutes, TBBPA and ATE were practically completely eradicated followed by first-order kinetics. Under 120 minutes, the NiO@CuHCF was able to achieve an ideal elimination rate of 91–97 % and a debromination rate of over 75.4–82.3 %. Major reaction products or intermediates were discovered using HPLC and GC-MS.

PAPER ID-176

Machine learning Remote Sensing Image Processing

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Abstract

Remote sensing imagery image processing and interpretation is employed for extractive industries hydrocarbon, minerals mapping, coal geothermal energy resources exploration, agriculture crops, land use, pedology soil texture studies, Geohazards monitoring, disaster management, carbon, methane aerosol emissions detection for climate change, environmental monitoring and management, forest, wildlife conservation, etc. High resolution Image processing is completed by using wavelet transform. Wavelet transform computation dilation first the translation this is not commutative. Graphic processing unit GPU is used for image analysis sobel filter -gradient filter canny edge detection etc. Machine learning ML, deep learning DL in image processing uses computer algorithms for understanding the relationships between large amounts of complex interrelated surface geological geoinformation data. Artificial intelligence adaptive, cognitive science applications for geosciences surface imaging and interpretation, Artificial Neural Network RNN-time series data, ANN-CNN Convolutional Neural Network, DNN Deep Neural Network, ResNet Residual Neural Network, unsupervised and supervised machine learning, deeplearning, reinforcement learning for image processing, geosciences data analytics,bigdata analytics,etc. Physics Informed Neural Network PINN greybox model [whitebox-physics,blackbox-data, black+white= grey], Graph Neural Network GNN machine learning for subsurface imaging and interpretation. Dictionary learning is a branch of signal processing and machine learning that aims at finding a frame (called dictionary) in which some training data admits a sparse representation. wavelet transform for machine learning WCNN training CNN with wavelet transform for image classification and geological feature extractions. The most highly-used subset of ImageNet is the Large Scale Visual Recognition Challenge (ILSVRC) evaluates algorithms for object detection and image classification at large scale. One high level motivation is to allow researchers to compare progress in detection across a wider variety of objects -- taking advantage of the quite expensive labeling effort. Another motivation is to measure the progress of computer vision for large scale image indexing for retrieval and

annotation. Partial Differential Equations are also used for image processing. Machine Learning (ML) and remote sensing technology aids in many applications requiring large amounts of spectral and geospatial data needed for pattern recognition. ML uses algorithms through computer systems, computer vision, and ML DL techniques to collect and identify features in Earth science with precise accuracy and speed. ML a subset of Artificial Intelligence (AI) and computer vision (CV) to understand the data collected in order to find resolutions for remote sensing data and improve the overall accuracy of the data classification and can enhance the reliability and assessment of the features of data collected. ML algorithms through neural networks can improve the analysis of large areas to classify objects, identify temporal change, data fusion, cloud removal, and spectral analysis from satellite or aerial imagery that will overcome challenges of remote sensing data. Satellite observations geospatial data Hyperspectral Satellite sensors, advanced spectral resolution and capabilities to detect carbon (CO2) and methane (CH4), aerosol emissions and monitoring. My role whole sole goal to control greenhouse gases emissions with a view to global warming mitigation and climate change.

PAPER ID-177

Green Remediation: Ecological Approach for Mitigating Environmental Contamination

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Abstract

Mining operations, increased waste production, industrialization, and contaminated irrigation water all contribute to the alarming rate of heavy metal pollution in freshwater supplies. Through bio magnification, these hazardous substances can cause nephrotoxicity, endocrine disruption, mutations, and other major health hazards when they reach the food chain. As a result of scientific and technological developments, "phytoremediation" has become a viable and environmentally responsible method of removing toxins from the environment. Remediation using plants is not a novel concept, it has been around for a long. By extracting and eliminating elemental contaminants or reducing their bioavailability, a technique known as phytoremediation is carried out. Through their roots, plants may take in even trace amounts of ionic chemicals from the polluted ecosystem. The present review covers a few cutting-edge contemporary technology that have improved phytoremediation and aims to offer useful resources for sustainable solutions to scholars, practitioners, and policymakers.

PAPER ID-178

Socioeconomic evaluation of ecosystem service of Chail wildlife sanctuary Himachal Pradesh, India

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Abstract

This study presents a comprehensive evaluation of the ecosystem services provided by Chail Wildlife Sanctuary, a significant ecological region in Himachal Pradesh, India. Renowned for its rich biodiversity, the sanctuary plays a critical role in supporting both environmental integrity and local livelihoods. Employing a mixed-methods approach that integrates field surveys, economic valuation techniques, and stakeholder interviews, this research aims to quantify and analyze the diverse ecosystem services rendered by the sanctuary. The assessment categorizes these services into four primary types: provisioning, regulating, supporting, and cultural. Provisioning services encompass the supply of timber, medicinal plants, and non-timber forest products, all of which are essential for local economic activities. Regulating services include carbon sequestration, climate regulation, water purification, and flood mitigation, contributing to the ecological stability of the region. Supporting services, such as soil formation and nutrient cycling, are fundamental for sustaining the sanctuary's biodiversity. Cultural services encompass recreational opportunities, ecotourism, and spiritual values, which enhance the quality of life for both local residents and visitors. The findings of this study indicate that the total economic value of these ecosystem services is substantial, underscoring their pivotal role in sustaining local communities and preserving biodiversity. Furthermore, the valuation emphasizes the interconnectedness of ecosystem health and human well-being, highlighting the imperative for sustainable management practices that safeguard these vital resources. This research advocates for the integration of ecosystem service valuation into conservation strategies and local development policies. By illuminating the multifaceted benefits of Chail Wildlife Sanctuary, this study aims to inform stakeholders and policymakers, fostering practices that ensure the long-term health of the ecosystem while promoting community resilience and economic sustainability.

PAPER ID-179

Impact of climate change on the distribution of *Paris polyphylla* Sm.: A vulnerable medicinal plant in the Himalaya

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Abstract

Paris polyphylla locally known as *'Satuwa'* belongs to the Melanthiaceae family and has a global significance due to its wide range of medicinal properties. It is a promising traditional therapeutic and threatened herb of the Himalaya. Because of a wide range of medicinal benefits, the species is facing a serious threat from illegal extraction, causing challenges in natural regeneration and becoming vulnerable globally. Every ecosystem is strongly influenced by the climate, and climate change is recognized as a major element influencing how forest vegetation. Therefore, for the conservation of the species, the probable distribution of the species under changing climatic conditions has been investigated in the Hindu Kush Himalayan Region (HKH) in the current study. A total of one hundered ninety (190) species point data, environmental variables (24) and MaxEnt algorithm were used. The model calibration test for *P. polyphylla* was satisfactory (Area under Curve test value = 0.941±0.017). The model output showed that the total suitable area for the occurrence is ~2,55,000 km^2 under current environmental conditions. The annual precipitation and minimum temperature of the coldest month were found to be the main factors influencing the species distribution. For both global climate models (BCC-CSM2-MRand MIROC6) under optimistic (SSP_245) and middle-of-the-road (SSP_370) climate change scenarios, the total suitable area for the species is predicted to increase under changing climatic conditions. The species will migrate to higher elevations along the boundaries of its present distribution in China, Myanmar, and the Indian Himalayan Region (Himachal Pradesh and Uttarakhand). Highly suitable areas are considered to be very important for improving the species' conservation situation. The locations where the likelihood of a species' occurrence is highest can be used for in-situ conservation. Planners and policymakers could create appropriate management strategies with the aid of the species' forecasted range maps.

PAPER ID-180

Fabrication of Zerovalent Iron-Based Nanomaterials using Green Approach for Hydrolysis Lignocellulosic Biomass

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Abstract

The present investigation deals with the synthesis of nanomaterials like zerovalent iron nanoparticles (nZVI), ZnO nanoparticles and nZVI/biopolymer-supported nanocomposite by green method utilizing Melia azedarach, leaf extract as a biogenic, capping and reducing agent for hydrolysis of biomass. These ecofriendly methods help develop sustainable nanomaterials for potential applications in biomass hydrolysis. Structural characterization was performed for the synthesized nanomaterials using Fourier transform infrared spectroscopy (FTIR), ultraviolet-visible absorption spectroscopy (UV-Vis), Scanning electron microscopy (SEM), X-ray diffraction (XRD) and EDS. The results indicate successful synthesis of the nanoparticles produced, demonstrating their potential for environmental remediation and other applications. Further, these nanomaterials will be used in cellulase enzyme immobilization and the hydrolysis of lignocellulosic biomass conversion.

PAPER ID-181

Adaptive Laboratory Evolution of *Candida shehatae* for Enhanced Xylose Fermentation into Ethanol and Xylitol

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Abstract

The efficient bioconversion of lignocellulosic biomass into biofuels and biochemicals is a promising approach for sustainable energy production. The yeast *Candida shehatae* naturally possesses the ability to ferment xylose, a key sugar derived from the acid hydrolysis of lignocellulosic biomass, into ethanol and xylitol. However, the industrial application of *C. shehatae* is often limited by its low fermentation efficiency and suboptimal sugar consumption rates. In this study, we employed adaptive laboratory evolution (ALE) approach to improve the fermentation performance of *C. shehatae* on xylose. By repeatedly transferring inoculum from the previous batch of fermentation into fresh media, we progressively enhanced the yeast's tolerance to xylose and improved its sugar utilization efficiency. Over successive generations, *C. shehatae* displayed significant improvements in growth rates, sugar consumption, and product titers of ethanol and xylitol. These results indicate that the adaptive evolution strategy can be effectively selected for developing more robust strains capable of higher sugar uptake and product yields. This study highlights the potential of ALE to enhance the industrial viability of *C. shehatae* for bioethanol production, contributing to more efficient and sustainable biofuel processes.

PAPER ID-182

Integrating Traditional Ecological Practices with Algal Technology for Sustainable Wastewater Treatment

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Abstract

Indian Knowledge System (IKS) is the amalgamation of vast traditional ecological wisdom with immense promise for the betterment of sustainable practices and environments. This mini-review explores the deployment of traditional knowledge in the context of algal based wastewater treatment systems, hence demarcating a synergy between ancient practices and modern technological advances. It has lately been found that algae are more effective toward nutrient removal as well as water purification; hence, there is great scope regarding wastewater treatment scenarios in India. Historically, traditional Indian practices have really focused on the preservation of biodiversity and also on the health of the ecosystem, while techniques such as phytoremediation reflect deep understanding of the natural process. This integration of indigenous practices with all the new potentials that come from algal technologies will then help to drive this kind of efficiency of wastewater treatment, but then promotes a holistic approach to resource management. Besides wastewater treatment, algal based systems produce biomass that can then be used for biofuels, fertilizers, and animal feed, thereby contributing to the building of a circular economy. Algal based systems embedded in IKS are likely to open up novel solutions while instilling community engagement and local stewardship for environmental resources. Revitalizing traditional ecological knowledge will lead to resilient systems that adapt well to modern challenges but will preserve cultural heritage. The review very strongly makes a case for furthering interdisciplinary research to bridge IKS with contemporary science. It calls for policy support of sustainable practice, which is based on traditional knowledge. Ultimately, integrating IKS into algal based wastewater treatment systems promises environmental sustainability, public health benefits, and nurturing the country's development agenda.

PAPER ID-183

Utilisation of Blended Agro-residual Biomass for Production of Fuel Pellets as Sustainable Fuel

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Abstract

The increased demand for global energy promotes the widespread use of fossil fuels, which release large volumes of CO_2, causing pollution and climate change. The need for energy and environmental degradation are the intrinsic problems associated with linear fossil-based economy. Since fossil fuels are becoming less readily available and their use causes significant environmental issues, there is increase in focus on alternative energy sources. The agricultural production residues offer a promising area owing to their substantial generation. Densification of agro-residual biomass into fuel pellets provides a viable way to produce solid fuels that can take the place of coal, release bioenergy, cut carbon emissions, and make use of organic wastes. The majority of biomass used to generate heat and electricity is made up of solid biomass. Pelletisation enhances raw biomass's energy density, heating value, and structural homogeneity. It would lessen an excessive reliance on wood for fuel. The blending process aims to enhance the physical and chemical properties of the biomass, improving pellet durability, calorific value, and combustion efficiency. the optimal blend ratio significantly boosts energy output and reduces emissions compared to single biomass pellets. This study aims to review the potential of fuel pellets made from agricultural residues and the impact of blending different residues on the properties of fuel pellets in terms of proximate characteristics and calorific value which could help maintain environmental sustainability and energy security. Additionally, the economic feasibility of large-scale pellet production is assessed, highlighting cost benefits and potential for rural development.

PAPER ID-184

A Novel Colorimetric Sensor Utilizing Nanoparticles for Detecting Pesticides Environments

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Abstract

Pesticide contamination in aquatic ecosystems remains a serious threat to both environmental and human health. This study presents a noval colorimetric sensor designed for detecting pesticides in water samples from the Jammu region of Jammu & Kashmir. The sensor employs cost-effective metal oxide nanoparticles, iron oxide (Fe_2O_3) and zinc oxide (ZnO), to achieve efficient monitoring of pesticide presence. Herein, we developed a sensor that operates on surface plasmon resonance (SPR) and nanoparticle aggregation. The presence of target pesticides causes a clear colorimetric change in the nanoparticle solution. To enhance specificity and sensitivity, Fe_2O_3 and ZnO nanoparticles were functionalized through a systematic optimization process. The sensor was designed to detect common pesticides, including organophosphates and carbamates. UV-Vis spectroscopy was used to quantify the colorimetric response, which showed a significant absorbance shift corresponding to the pesticide concentration. Interference studies confirmed the sensor's robustness and selectivity in complex environmental samples, highlighting its practical potential. The findings suggest that metal oxide nanoparticles offer an effective and low-cost solution for rapid colorimetric pesticide detection, making them a valuable tool for environmental monitoring and water quality assessment.

PAPER ID-185

Ancient Techniques Guiding Modern Environmental Practices in Water Treatment: State of the Art

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Abstract

Wastewater management in India has remained a crucial aspect of Indian civilisation. Ancient Indian texts, including the Rig Veda**,** Arthashastra**,** Manusmriti**,** and Varahamihira's Brihat Samhita**,** contain descriptions of water harvesting, water conservation, and rituals associated with water purification. Ancient water purification techniques in India included the use of charcoal (biochar)**,** layers of coarse gravel**,** and sand**.** Texts such as the Sushruta Samhita document techniques such as boiling, sun exposure, and the use of different antibacterial herbs for the treatment of water for drinking purposes. Additionally, advanced drainage systems in cities like Mohenjo-Daro used sedimentation tanks for water filtration, while different plant seeds served as natural coagulants for sedimentation. The reuse of greywater for agricultural irrigation and sustainable practices were also essential components of ancient water management. These methods are in harmony with contemporary environmentally friendly water purification systems, including biochar for pollutant absorption, green chemistry approaches, and natural coagulants for treating water. This study comprehensively reviews and connects ancient Indian techniques with modern wastewater management solutions, showcasing how traditional knowledge has influenced today's sustainable approaches to water treatment.

PAPER ID-251

Constructed Wetlands: Eco-Friendly Technology for Wastewater Management

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Abstract

Growing populations need more water which has released massive amounts of wastewater from various sources, such as industrial and agricultural runoff, residential sewage, and agricultural runoff. These sources have contaminated water bodies, indirectly harming the aquatic life there. The pollution of water bodies resulting from the release of untreated wastewater impacts both urban and rural regions, posing a threat to human health and the environment. Constructed wetlands are a sustainable and eco-friendly technology to treat a variety of wastewater pollutants by mimicking the activities of natural wetlands. It can offer several advantages, including the ability to reuse water and reduce disease and environmental degradation. These systems utilize natural processes such as wetland vegetation, soils, microorganisms, and substrates to effectively remove pollutants such as nutrients, organic matter, suspended solids, and pathogens are removed from these systems by the combination of physical, chemical, and biological processes that occur naturally in wetlands from various wastewater sources. This study evaluates the performance of different CW designs, demonstrating their ability to treat wastewater while enhancing biodiversity and promoting water reuse. Constructed wetlands provide a cost-effective and environmentally sustainable alternative to conventional wastewater treatment systems, contributing to global water management and conservation efforts.

PAPER ID-252

PVA-Agar Semi-Interpenetrating Polymer Network Based Cation Exchanger for Removal of Cr (VI)

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Abstract

The current study focuses on the utilization of a biodegradable and cost-effective cation exchanger to remove Cr(VI) metal ions from water sources. Semi-IPN was synthesized with grafting acrylamide onto an agar-polyvinyl alcohol hybrid backbone in the presence of boric acid crosslinker and ammonium persulfate as reaction initiator. Phosphorylation converted graft copolymer into a cation exchanger. The characterization techniques such as FTIR, SEM-EDX, and XRD were used for analysis of samples. Semi interpenetrating polymer network had improved thermal stability. The results showed that the optimal conditions for Cr(VI) removal are pH=4.0, contact duration (min)=360, adsorbent dosage (mg)=125, and metal ion concentration (ppm) =2. The pseudo second order kinetic model best fits the adsorption kinetics of Cr(VI) ions, with an R^2 =0.99 and K_F (rate constant) = 0.97, confirming the Freundlich isotherm. The adsorption isotherm models utilized in this work were found suitable with the Freundlich model due to multilayer adsorption, although the pseudo second order model provided the most accurate description of adsorption kinetics. The present study shown great potential for Cr(VI) removal, with an adsorption capacity of 85%. Furthermore, reusability investigations shown that the cation exchanger may be utilized successfully for up to four cycles.

MATHEMATICAL SCIENCES & ENGINEERING & TECHNOLOGY

Paper ID-169

Low-stress mechanical behavior of cut resistant fabric

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Abstract

This study investigates the influence of weaving patterns and materials on the low-stress mechanical properties of cut resistant fabric. Throughout this study project, an attempt has been made to determine the ideal fabric design with precise fibre content for cut protection apparel. The clothing specimen was fabricated using three different weave designs: plain, 2/2 twill, and 6-end satin. The para-aramid/modacrylic/stainless steel core spun yarn, ultrahigh molecular weight polyethylene (UHMWPE)/polyester/stainless steel core spun yarn, and para-aramid staple spun yarn, designated as A, B, and C, respectively, were used to create the nine sets of hybrid woven fabric samples. Each specimen's low-stress mechanical characteristics, such as sensory comfort and tensile, shear, bending, compression, surface friction, and roughness, were assessed using the Kawabata assessment technique. Comparing the 6-end satin weave cloth to other weaves, it exhibits superior tactile comfort qualities. It is also remarkable that ultrahigh molecular weight polyethylene (UHMWPE)/polyester/ stainless core spun yarn material influences the low-stress mechanical attributes of each fabric with three distinct weave designs.

Paper ID-170

Enhancing Sustainability and Quality: A Comparative Study of Sunflower Oil Extraction Methods and Physicochemical Characterization

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Abstract

Safety, sustainability, and environmental protection are of great concern for any technology. In order to minimize or eliminate the harmful effect of solvent used in the oil extraction process the present work focused on the use of eco-friendly approach of supercritical carbon dioxide in the effective extraction of oil from sunflower seeds. The used method is becoming popular nowadays due to its effectiveness, eco-friendliness, and improved oil quality for healthier cooking. Attempts were made to explore the differences in the physicochemical properties of

extracted sunflower seed oil obtained through Soxhlet extraction and supercritical carbon dioxide extraction methods. Variations in physical and chemical properties were observed. The results indicated that the specific gravity of oils extracted by supercritical carbon dioxide extraction was 0.95 ± 0.004, and for oils extracted through solvent extraction using hexane was 0.913 ± 0.01. It was also found that flash and fire points of supercritical carbon dioxide extracted oil were having 317.4±0.7 O C and 342.27±2.25 O C, respectively, while for hexane-extracted oil had 320.2±1.02 O C and 340.78±2.42 O C, respectively. Analysis of fatty acid profiles using Gas-Chromatographic revealed high levels of unsaturated fatty acids in sunflower oil (89.66±0.078%) mainly due to the presence of linoleic acid and cis-oleic acid with 10.23±0.145% saturated fatty acid. The high levels of unsaturated fatty acids in the oil are used as a versatile ingredient for varied applications such as pharmaceuticals, food, chemical, and environmental areas to support a sustainable future.

Paper ID-171

An Efficient CNN-Based Deep Learning approach to Detect and Prevent Gray Hole attacks

Kanchan

Research scholar

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Abstract

Ad hoc networks that are mobile in nature, or MANETs (Mobile Ad Hoc Networks), have the ability to move their nodes and reconfigure themselves. Since MANETs are mobile networks by design, they connect different networks wirelessly and don't require any infrastructure or centralized management. The nodes help one other out by forwarding data packets to other nodes in the network while they converse with one another. As a result, the nodes use routing protocols to find a way to the destination node. One kind of attack that can occur in a MANET is the Grey Hole attack. One kind of active assault that frequently drops packets while routing from source to destination is the 'grey hole' attack. We will be using approaches in various network environments as part of our research. MATLAB will be used to execute the simulations, and the outcomes will be documented and assessed in terms of throughput, packet loss, delay, and residual energy for a range of round counts.

Paper ID-172

Seismic analysis of building with or without composite columns

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Abstract

Concrete and steel are the widely used construction materials in the modern era. The composite construction has significantly reduced the use of RCC and steel construction. Erecting composite columns requires specialized knowledge and careful supervision during construction to ensure proper bonding between the concrete and steel components. Many local and small contractors in India may not have experience with composite construction, which could lead to challenges in implementation. Over time, maintenance requirements for composite columns can be higher compared to RCC columns, particularly in terms of inspecting and maintaining the bond between the steel and concrete to prevent corrosion and ensure structural performance. The present study focuses on the comparison of the behavior of structure when composite columns of a building were replaced with complete RCC or steel columns at upper floor levels. Three different models such as model I consists of complete RCC steel columns, model II consists of composite with RCC columns, and model III consists of composite with steel columns were used for the analysis of the building. All structures are analyzed for seismic zone V with importance factor 1.2. The basic plan dimensions are 42x25m. This study finds that steel columns give well-settled results as compared to the RCC columns. RCC sections provide more weight to the building which affects the overall behavior. So, steel sections provide less base shear due light weighted members, and analysis results are within their permissible limits.

Paper ID-173

Optimization and Prediction of Breaking Energy in Dual-Sheath Single-Core Hybrid Yarns Using Box-Behnken Design

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Abstract

This study investigates the optimization and prediction of the energy required to break a dual-sheath single-core hybrid yarn, using the Box-Behnken Design (BBD), a variant of Response Surface Methodology (RSM). Three critical parameters—HPPE denier, stainless steel micron size, and twist per meter—were evaluated to assess their impact on yarn breaking energy. The hybrid yarn, composed of a stainless-steel core, a polyester inner layer, and an ultra-high molecular weight polyethylene (HPPE) outer layer with opposing twist directions, was subjected to tensile testing using an Instron 3365 machine. The results demonstrated that the optimal configuration, with 200 twists per meter, 400 Den HPPE, and 50-micron stainless steel, achieved a maximum breaking energy of approximately 0.428 J. A comparative analysis of regression models revealed that the two-factor interaction (2FI) model provided the best fit, with $R^2 = 0.9621$, adjusted $R^2 = 0.9337$, predicted $R^2 = 0.7996$, and an adequacy precision value of 19.6816. The model's significance was corroborated by ANOVA (F-value = 33.84, P-value < 0.0001), and its predictive accuracy was affirmed with an average relative error of 3.46%. These results underscore the efficacy of the BBD approach for optimizing the energy needed to break hybrid yarns and offer valuable insights for enhancing their performance in diverse applications.

Paper ID-174

Non-Enzymatic Periodic Metamaterial Array backed Dielectric top Sensor for Glucose Sensing

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Abstract

Diabetes is a chronic and one of the most widespread incurable diseases throughout the world. In order to diagnose and measure blood glucose levels of the diabetics, a highly sensitive glucose sensor is of utmost requirement now. In this work, we have proposed a new metamaterial array-based sensor designed over a thin Rogers Duroid dielectric substrate with permittivity 2.2, permeability 1, and tangent delta 0.0009. The periodically arranged complementary unit elements in ground plane of the sensor will constitute to make a metamaterial with negative permittivity and negative permeability. The unit cell has been studied using eigen solver in high end 3D-simulations that provided fast wave characteristics (propagation constant < 1). A dielectric study has been performed using different dielectric materials such as FR4, Silicon, and PET (Polyethylene Terephthalate) with permittivity's 4.3, 11.9 and 3.8 before choosing the substrate for the sensor. The complementary multiple concentric rings on the top provides a sensing region where different analytes such as Nacl, fructose, sucrose, vitamins, proteins and glucose have been tested. The deionized aqueous solutions have been prepared for testing over the proposed sensor directly by pouring a fixed amount of solution. The results show a high sensitivity obtained for glucose in the particular frequencies of 3.25 GHz, 7.75 GHz and 9.05 GHz. Further, the sensor proposed is highly selective for glucose rather than other similar analytes that can affect diabetics more prominently. The sensor can be further integrated on a system level by minimizing the dimensions for the proposed sensing application.

Paper ID-199

Study of Free vibrations for rigidly fixed electro-magneto non-local thermoelastic hollow cylinder with voids material

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Abstract

This paper deals with the vibrations of rigidly fixed electro-magneto nonlocal elastic voids cylinder with generalized thermoelasticity. Here the surfaces of nonlocal elastic hollow cylinder have been assumed isothermal/thermally insulated and rigidly fixed. For the study of the vibrations of rigidly fixed boundaries, we adopt numerical Iteration method by using MATLAB tool. The real parts of generated data have been considered natural frequencies which are as shown in tables. Numerical computations in local/nonlocal elastic materials for free vibration field functions have been displayed graphically. Analysis of free vibrations of rigidly fixed boundary conditions has been investigated under LS and GL model of generalized electro-magneto-thermoelastic nonlocal cylinder with voids material. The vibrations of frequency relations are investigated analytically and numerically. The simulated results are presented graphically for frequency shift, quality factor. Also the real parts of frequencies named as natural frequencies have been shown in table. The graphical representation and table shows that the variation of vibrations is larger in case of GTE model in comparison to CTE and elasticity models.

Paper ID-200

Stability Analysis of Convection in Rotating Fluid Layers with Triple Diffusion

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Abstract

The onset of convection in a triply diffusive Boussinesq fluid layer, which is kept under the influence of uniform vertical rotation, has been investigated using a linear stability analysis. The criterion for the onset of stationary and oscillatory convection is derived analytically. The study includes numerical and graphical presentations that illustrate how dimensionless parameters like the Rayleigh number, Prandtl number, Lewis number and Taylor number affect the stability of the flow. These parameters provide insights into how rotation and diffusive processes influence the onset of fluid motion in such layered systems.

Paper ID-201

Stability Analysis of Convection in Rotating Fluid Layers with Triple Diffusion

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Abstract

The onset of convection in a triply diffusive Boussinesq fluid layer, which is kept under the influence of uniform vertical rotation, has been investigated using a linear stability analysis. The criterion for the onset of stationary and oscillatory convection is derived analytically. The study includes numerical and graphical presentations that illustrate how dimensionless parameters like the Rayleigh number, Prandtl number, Lewis number and Taylor number affect the stability of the flow. These parameters provide insights into how rotation and diffusive processes influence the onset of fluid motion in such layered systems.

Paper ID-202

Characterization of the non-oscillatory motionin Darcy-Brinkman convection in a porous medium saturated with a binary viscoelastic fluid

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Abstract

The paper mathematically establishes the principle of the exchange of the stabilities in binary viscoelastic fluid saturated porous medium (Darcy brinkman model) and is valid for where is Darcy-Rayleigh number, is Relaxation parameter, is Darcy-Prandtl number, is normalized porosity,is retardation parameter issolute Rayleigh number and Lewis number. The result is valid for free and rigid boundaries.

Paper ID-203

Effect of Different Thermal boundary conditions on boundary layer flow of stretching sheet

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Abstract

The study investigates the impact of various thermal boundary condi- tions on the boundary layer flow over a stretching sheet, which is signifi- can in numerous industrial and engineering applications such as heat ex- changers, Nano fluid technology, porous media and MHD system. Bound- ary layer behavior around stretching sheets is influenced by both fluid dynamics and heat transfer mechanisms. This research analyzes differ- ent thermal boundary condition and their effects on flow characteristics of isothermal, convective, and prescribed heat flux conditions including velocity and temperature distributions within the boundary layer The different thermal boundary condition significantly affect the temperature field, skin friction coefficient and heat transfer rate. The flow and heat transfer characteristics are significantly influenced by the type of thermal boundary condition applied, such as constant wall temperature (CWT), constant heat flux (CHF), and convective boundary conditions (CBC).the Prandtl number (Pr), stretching ratio, and thermal diffusivity are varied to understand their influence on the thermal boundary layer. The gov- erning equations such as continuity, momentum, and energy equations, are transformed into a non- dimensional form suitable for analysis. By applying distinct thermal boundary conditions constant surface temper- ature, constant heat flux, and convective heat transfer. The solutions are obtained by using numerical methods, and the results indicate that the choice of thermal boundary condition substantially alters the flow characteristics, including velocity distribution, thermal gradient, and heat transfer rates.

Paper ID-204

COMPUTATIONAL ANALYSIS OF MHD WILLIAMSON HYBRID NANOFLUID FLOW OVER CURVED STRETCHING SHEET

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Abstract

The motive of the present study is to examine the two-dimensional, incompressible hybrid nanofluid flow over a curved stretching sheet coiled in a circle with radius R. The hybrid nanofluid has synthesized by dispersion of GO and nanoparticles with the base fluid MeOH. The governing nonlinear partial differential equations are transformed into ordinary differential equations by using suitable similarity transformations. The system of equations is then solved using the built-in bvp4c solver in MATLAB. The results of the study are presented through a combination of tables and graphs, which provide insight into the behavior of the hybrid nanofluid flow and thermal characteristics under varying conditions. The findings demonstrate that the velocity and heat profile have been decreased due to the increasing volume percentages of ferrous and graphene oxide nanoparticles. This research enhances understanding of hybrid nanofluid behavior in applications such as advanced cooling systems, heat exchangers, and other thermal management technologies in the impact of curved geometries on fluid dynamics and heat transfer.

Paper ID-205

On the degenerate submanifolds in an indefinite cosymplectic statistical manifold

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Abstract

This paper introduces the notion of an indefinite cosymplectic statistical manifold. It studies the geodesicity in contact Cauchy Riemann and Screen Cauchy Riemann light like submanifolds of the indefinite cosymplectic manifold. Additionally, it presents findings related to the totally geodesic foliations and integrability of distributions in these submanifolds.

Paper ID-206

Effects of Poisson ratio and thermal in creep deformation stress distribution isotropic rotating disk

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Abstract

This article deals with the effect of Poisson's ratio in an isotropic disk in subjected to thermal gradient in creep transition stresses. Seth's transition theory and generalized strain measures are used for finding the governing equation. Mathematical modeling is based on stress –strain relation and equilibrium equation. It is assumed that the material properties, such as elastic modulus, Possion's ratio and thermal expansion coefficient are considered to vary using a power law function in the radial direction. Analytical solutions are presented for isotropic disk. This paper also presents a study pertaining to change in stresses and strain rate due to change in Poisson ratios and presence of thermal effects. It has been observed that the thermal effect decreases the value of radial stress at the internal surface of the rotating isotropic disc made of compressible material as well as incompressible material and this value of radial stress further much increases with the increase in angular speed. The behaviour of thermal effect has been seen in creep stage. With this effect, the maximum value of strain rates further increases at the internal surface for compressible materials as compared to an incompressible material.

Paper ID-207

A Note on H-normality in Generalized Topological spaces

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Abstract

We present a novel category of generalized topological spaces called H-normal spaces, defined using hereditary classes. Our study focuses on their properties and characterizations. Additionally, we offer counterexamples that illustrate how certain results applicable in traditional topological spaces do not hold in these generalized settings.

Paper ID-209

Numerical Investigation of a Rotating Viscoelastic Nanofluid Layer Saturating in a Porous Medium

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Abstract

In the present paper we study the numerical investigation of a rotating viscoelastic nanofluid layer saturating in a porous medium. To describe the rheological behaviour of a viscoelastic fluid the Oldroyd-B model is used. Oscillatory modes are introduced due to the presence of rotation and viscoelastic parameters, which were no-existence in their absence. The model used for nanofluid combines the effect of Brownian motion along with thermophoresis. Using linear stability analysis and normal mode technique, the main focus is on the stationary and overstable convection for stress free boundary conditions. The numerical computations are carried out by varying the values of different parameters, the stress- relaxation time parameter, strain- retardation time parameter, concentration Rayleigh number, Prandtl number, Taylor number and Lewis number on the stability of the system have been computed numerically. Results indicate that there was competition among the processes of thermophoresis, Brownian diffusion, angular velocity and viscoelasticity which cause oscillatory rather than stationary convection to occur. Oscillatory instability is possible with both bottom- and top-heavy nanoparticle distributions. It is found that the stress relaxation parameter has destabilizing effect on the system, while strain-retardation-parameter has stabilizing effect on the system on the oscillatory modes of system, the thermal Prandtl number advances the convection in the oscillatory modes, the concentration Rayleigh number advances both oscillatory and stationary modes thereby destabilizing the physical system, the effect of the capacity ratio is to stabilize the oscillatory modes, thereby postponing the onset of oscillatory convection, the modified diffusivity ratio (accounting for the thermophoresis parameter) stabilizes the system for both top-heavy and bottom-heavy distribution for the oscillatory convection is delayed, further the medium porosity has destabilizing effect and Taylor number has large enough stabilizing effect on the both the stationary and oscillatory modes. Medium porosity have destabilizing effects on the viscoelastic rotating nanofluid layer saturating in a porous medium.

Paper ID-210

Numerical investigations on stability of stratified viscoelastic Walters' (model) fluid/plasma in in the presence of vertical magnetic field and quantum pressure

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Abstract

Quantum effects on the Rayleigh-Taylor Instability in an inhomogeneous stratifiedincompressible, viscoelastic Walters' (model B') fluid/plasma in presence of magnetic field are investigated. The linear growth rate is derived for the case where a plasma with exponential density, viscosity, viscoelasticity and quantum parameter distribution is confined between two rigid planes at The solution of the linearized equations of the system together with the boundary conditions leads to derive the dispersion relation (the relation between the normalized growth rate and square normalized behaviour wave number) using normal mode technique to explain the roles that play the variables of the problem. The behaviour of growth rates with respect to the quantum effect and kinematic viscoelasticity are examined in the presence of kinematic viscosity. The results show that the vertical magnetic field bring about more stability for a certain wave number band on the growth rate of unstable configuration. It has been found that the effect of quantum pressure with the simultaneous presence of magnetic field is more stabilizing.

Paper ID-211

A logistic approach in real life phenomena

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Abstract

In this paper explores the mathematical modelling of India's population using the logistic growth model. The study includes a detailed analysis of the model's components, such as the intrinsic growth rate and carrying capacity. The role of ordinary differential equations(ODEs) in population modelling is examined, focusing on solution (methods like separation of variables and the Runge-Kutta 4th order method). The main motive of paper is predicting population trends under various scenarios, analysing the implications for policy and planning. Overall, this paper provides a comprehensive mathematical framework for understanding and predicting India's demographic trends.

Paper ID-212

Energy Dissipation Dynamics in Bulged Profiles in Sinter Forging

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Abstract

This paper explores various aspects of bulging in high-speed sinter-forging across different relative densities. The forging process of sintered preform involves significant energy dissipation, affected by factors like die speed, bulging coefficient, initial relative density and height reduction. High die speed result in increased frictional energy dissipation, leading to surface heating and bulging. Moreover, there's a notable increase in energy dissipation, die load, and frictional energy with a reduction in height, primarily dissipating a heat on the preform surface. Total energy dissipation, die load, and frictional energy notably increase with die speed, particularly with higher bulging coefficients and initial relative densities. Additionally, inertial energy dissipation rises rapidly under these conditions. The intricate relationship between fractional internal energy dissipation and fractional frictional energy dissipation to total energy dissipation highlights the complexity of the process, with internal energy dissipation decreasing while frictional energy dissipation component increases with bulging coefficient and relative density. At high die velocities, most energy dissipates as frictional heat, underscoring the need to control forging velocity for desired product outcomes.

Paper ID-246

Retrofitting of An Existing Residential Building Using ETABS Software

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Abstract

In the field of civil engineering, the concrete has been widely used as construction material from decades in the field of civil engineering. A large number of infrastructure assets in terms of buildings, bridges, towers and other structures were constructed all over the world. The structures require repair and maintenance with the usage of structures. When the structure becomes old and the age limit is reached, then a structural audit of the structure is to be required to check the quality of materials and serviceability or health of the building. To improve the structural strength and seismic performance, retrofitting of the structural component has become the necessity of the building. The main purpose of retrofitting in structures is to increase the survivability functionality. Retrofitting is technical interventions in structural system of a building that improve the resistance to earthquake by optimizing the strength, ductility and earthquake loads. In the present study, analysis of an existing building with the retrofitting of existing structural components such as beams, columns etc. was carried out using ETABS software. The aim of study was to understand the need and behavior of retrofitting by suitable method. An investigation has been carried out considering the strength requirement of a preexisting building of one basement and 10 stories and now there is proposal of increasing the number of stories to thirteen. Using the ETABS software a comparison has been carried out between ten storeys building and thirteen storey building. The conclusion presents the potential and effectiveness of adopting retrofitting and restoration instead of demolishing the existing structure and erecting a new one.

Paper ID-247

Innovative Conductive Textiles for Electromagnetic Radiation Shielding: Advancing Sustainability and Human Health

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Abstract

As the use of electronic devices continues to grow in the information age, concerns about prolonged exposure to electromagnetic (EM) radiation have intensified, particularly regarding its harmful effects on human health, such as brain tumours, sleep disorders, and cancer. Sustainable solutions are needed to mitigate these risks. This research explores the development of environmentally friendly conductive woven fabrics that offer significant electromagnetic shielding while maintaining comfort, affordability, and recyclability. The fabrics were produced using stainless steel multifilament yarns blended with 100% biodegradable viscose spun yarn. The study examines the impact of varying conductive metal content, weft density, and structural treatments on the shielding effectiveness of these textiles within the frequency range of 100 MHz to 1.5 GHz. Findings reveal that increasing conductive material content and weft density, along with fabric treatment in acidic conditions, significantly enhances EM shielding effectiveness. Among different woven structures, plain weaves demonstrated the highest shielding capacity compared to twill, sateen, and basket weaves. In line with sustainable design principles, the choice of biodegradable viscose contributes to reducing the environmental impact of the textiles while ensuring protection against EM radiation. Additionally, the research investigated the air permeability and water vapor transmission properties of the fabrics, essential for maintaining wearer comfort. Results showed that fabrics with higher stainless steel content had reduced air permeability, but those with high floats exhibited improved breathability. This work demonstrates that combining eco-friendly materials like viscose with conductive fillers such as stainless steel offers a promising solution for developing sustainable protective textiles. These materials not only provide shielding against harmful EM radiation but also align with global sustainability goals, reducing the environmental footprint of protective clothing used in high-risk environments.

Paper ID-248

Effect of material content on moisture management properties and air permeability of outer layer of fire fighters' clothing

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Abstract

The moisture transportation behaviour and air permeability characteristics of fire-protective textiles are often compensated for long-term exposure to fire that causes discomfort, even fainting, to the firefighters due to less sweat evaporation and over-body core temperature. This paper aims to get an idea of the moisture management attribute and air permeability phenomenon of woven fabric produced by varying the content of para-aramid percentage from 0 per cent to 100 per cent. Meta-aramid yarn of 2/40 Ne count and para-aramid yarn of about 10 Ne count were used to manufacture the fabric, maintaining the honeycomb weave structure. The areal density of all the fabrics was kept constant (150 10 g/m2), varying the picks per inch (PPI). The overall moisture management capacity and one-way transport capacity (were measured following AATCC 195-2009, and the air permeability was evaluated following the ASTM D737 method. The content of meta-aramid fibre and the construction of fabrics confirmed the fabrics compactness, which lowered air permeability by increasing picks per inch. On the other hand, overall moisture management capacity and one-way transport capacity decreased with the increment of para-aramid content percentage. The prediction of air and moisture management properties of meta and para-aramid fabrics of the outer layer of fire protective clothing is a very complex and less unexplored topic. Therefore, a novel attempt has been made in this research work to analyse the effect of content percentage on meta-aramid fabrics air and moisture management properties.

Paper ID-249

ANALYSIS OF (G+3) BUILDING IN HILLY AREA USING ETABS

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Abstract

Building planning and design in a hill town is a tough task because of the rough terrain, steep gradient, unfavourable climatic conditions, abundant vegetation, and susceptibility to natural hazards. Numerous vernacular practices and styles have developed in response to these challenging development conditions using local resources and indigenous methods to satisfy human needs in a sustainable manner with little harm to the environment. In the present study, G+3 reinforced concrete building situated in a hilly area was analyzed using ETABS software. The design uses ETABS to design the entire structure and involves manual load calculations, analysis, and design. The structure has been assessed, built, and explicitly described for self-weighted dead load, live load, and seismic loads in accordance with the guidelines of Indian standard codes. Cast-in-situ concrete, is a method of constructing in which the foundation, plinth beams, walls, columns, beams and slabs are all cast on the construction site using formwork. Due to monolithic construction, loads are distributed equally in all directions. The axial force, shear force, bending moment and shear reinforcement were evaluated. Results were found to be within permissible limits as per standards.

Paper ID-250

Earth Air Tunnel (ETA): A Passive Cooling Technique used in Architecture

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Abstract

The Earth Air Tunnel (EAT), also known as Earth-to-Air Heat Exchanger (EAHE), is a passive cooling and heating technique used in architecture to regulate indoor temperatures by utilizing the relatively constant underground temperature of the earth. This system is particularly effective in regions with extreme temperature variations and helps reduce energy consumption in buildings.

How It Works:

The Earth Air Tunnel system involves burying a network of pipes (usually made of materials like PVC or metal) underground, through which fresh outdoor air is drawn. The depth of these pipes, typically ranging from 2 to 4 meters underground, allows the air to exchange heat with the soil, which maintains a relatively constant temperature throughout the year.

• During Summer: Hot air from outside passes through the tunnel, where it gets cooled by the cooler temperature of the surrounding earth before entering the building.

• During Winter: Cold air passes through the same system and absorbs heat from the warmer earth, effectively pre-warming the air before it enters the building.

Key Components:

1. Air Inlet: Located outside the building, it draws in fresh air.

2. Underground Pipes: The length, diameter, and material of the pipes influence the efficiency of the system. Longer pipes and materials with high thermal conductivity enhance the heat exchange process.

3. Air Outlet: Positioned inside the building, where the conditioned air is released after passing through the tunnel.

4. Fans or Blowers: May be used to ensure a steady airflow through the system.

Benefits:

1. Energy Efficiency: By reducing the need for conventional air conditioning or heating, the system lowers energy consumption and operational costs.
2. Eco-Friendly: The EAT system uses renewable energy from the earth and produces no greenhouse gas emissions during operation.
3. Thermal Comfort: It maintains indoor temperatures at comfortable levels throughout the year, reducing temperature swings.
4. Low Maintenance: Once installed, the system requires minimal upkeep compared to active cooling and heating systems.

Paper ID-260

Study of the thermal properties of a water-based Williamson hybrid nanofluid SiO2-Al2O3/water over a stretched sheet with mixed convection

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Abstract

A base fluid is mixed with a composite nanopowder or several distinct nanoparticles to create a hybrid nanofluid, which is an extension of conventional nanofluids. The study of hybrid nanofluids thermal transport characteristics has been spurred by the need for improved heat transfer to control the rising heat density in miniaturized and numerous other technical processes. Here, the problem of the steady MHD mixed convection boundary layer flow is developed analytically using a type of hybrid nanofluid comprising silicon dioxide SiO2-Al2O3/water. In order to analyse the flow of a colloidal fluid over a stretching sheet through a porous media, heat transfer concerns must be taken into account. It also includes the effects of a heat source, thermal dissipation, and an invariant magnetic field. The partial differential equations are turned into ordinary differential equations using similarity transformations. The bvp4c method in MATLAB software is then used to solve the equations. The flow rate is observed to be slowed down by the magnetic field and increasing porosity. Besides that, it can be seen that the velocity $f'(\eta)$ declines with the augmentation of $\phi 2$ while the temperature of the fluid increases. In order to study how they change, physical quantities like skin friction, fluid temperature, local Nusselt number, and velocity are seen to change over a suitable range of new parameters.

Paper ID-261

Connection between Sudoku and Group theory

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Abstract

Sudoku, a popular logic-based puzzle, has gained widespread recognition not only for its entertainment value but also for its deep mathematical structure. This presentation explores the fascinating relationship between. Sudoku and group theory, one of the fundamental areas of abstract algebra. We will investigate how the symmetries of Sudoku grids can be described using group-theoretic concepts, particularly focusing on permutation groups, cyclic groups, and the idea of automorphism. By viewing Sudoku as a set of combinatorial constraints, we will demonstrate how solving the puzzle can be linked to finding specific cosets of permutation groups, providing insight into the puzzle's solvability and uniqueness. Through this approach, we aim to show how group theory can provide a more rigorous framework for analyzing and generating Sudoku puzzles, leading to potential new avenues in both recreational mathematics and pedagogical strategies for teaching abstract algebra. This exploration will emphasize the interdisciplinary nature of Sudoku and groups.

Paper ID-262

Some Applications of Boolean Algebra

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Abstract

Boolean Algebra is the set of rules used to simplify the given logic expressions without changing its original functionality. In this paper we emphasize the practical relevance of Boolean algebra, illustrating how its principles and techniques empower individuals to solve real- world problems with precision and efficiency. Boolean Algebra helps in simplifying and optimizing complex logic expressions, making them easier to implement in hardware. By using the basic Boolean laws and logic operations we can design switching circuits of our own convenience with its predictable behavior. Boolean Algebra plays a vital role in modern communication technology by detecting error and hiding the information. It provides the theoretical framework for designing this error detection mechanism efficiently and reliably, ensuring data transmission in digital system. Single bit parity is the simplest method to detect error while transmitting the data in digital communication. Cyclic Redundancy Check is more efficient method of error detection. Boolean algebra is a fundamental part of cryptography particularly in the design and analysis of cryptographic algorithms.

Paper ID-263

A critical Study on algorithms for addressing Transportation Challenges & Assignment Challenges in Fuzzy Conditions

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Abstract

Transportation is a fundamental aspect of modern society, facilitating the movement of people and goods across various distances. It underpins economic growth, social integration, and access to essential services. However, as our reliance on transportation systems grows, so do the challenges associated with them. These challenges encompass a broad spectrum of issues, including congestion, environmental impact, infrastructure decay, safety concerns, and socio- economic disparities. This essay explores these transportation problems in detail, highlighting their causes, implications, and potential solutions. whereas the assignment problem involves assigning a set of tasks to a set of agents in such a way that each agent is assigned exactly one task and each task is assigned to exactly one agent, with the goal of minimizing the total cost or maximizing the total profit of the assignments. This study presents an overview of the Hungarian method and algorithm for solving assignment problems. We explore its foundations and practical applications. Through clear examples, the research demonstrates the simplicity and efficiency of the Hungarian method, making it a valuable tool for enhancing resource allocation and task optimization. The main Objective of the study or comparison is the investigation of the minimization of the total transportation cost.

Paper ID-281

MAGNETOHYDRODYNAMIC FLOW(MHD)

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Abstract

Magnetohydrodynamcis (MHD) is a branch of fluid dynamics that studies the behavior of electrically conducting fluids in the presence of magnetic fields. In MHD flow, the interaction between the fluid's electrical conductivity and the magnetic field. This interaction can lead to complex and interesting phenomena, such as the generation of electric currents, the induction of magnetic fields, and the formation of plasma structures. In this abstract, we discuss the basic principle of MHD flow and its applications in various fields, such as astrophysics, fusion energy research, and industrial processes. We will also explore the challenges and opportunities associated with studying and controlling MHD flows including the development of advanced numerical simulation techniques and experimental methods. Overall, MHD flow is a fascinating and important area of research that has the potential to revolutionize our understanding of fluid dynamics and its applications in science and technology

Paper ID-282

The concept of Trigonometry

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Abstract

Trigonometry is one of the most important branches in mathematics that finds huge applications in diverse fields. The word trigonometry is derived from Greek words 'trigon' and 'metron' and it means 'measuring the sides of the triangle'. The subject was originally developed to solve geometric problems involving triangles. The branch called “Trigonometry” basically deals with the study of the relationship between the sides and angles of the right-angle triangle. There are six trigonometric functions that are commonly used: sine(sin), cosine(cos), tangent(tan), cotangent(cot), secant(sec), cosecant(cosec). Trigonometry is used in the calculation of lengths, areas and relative angles between objects. It is also used to measure wind speed, distance and direction. It plays a great role in astronomy, music, construction, physics and archaeology.

PaperID-283

RINGS- Definition, properties, applications

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Abstract- Rings are a fundamental concept in algebraic mathematics that consist of a set equipped with two operations addition and multiplication that satisfies certain properties .Rings have wide ranging applications across different branches of mathematics, including algebraic geometry, number theory coding theory and more.The purpose of this presentation is to provide an overview of the properties and applications of rings with their conclusion. The scope of the presentation will include definitions, important notes, properties of rings and some applications of rings and some applications of rings in mathematics.

Paper ID-284

TRANSPORTATION PROBLEM

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Abstract:

The transportation problem is a special type of linear programming problem, where the objective is to minimize the cost of distribution of a product from a number of source to a number of destinations. In this we have to find the initial basic feasible solution, unbalanced and balanced problem etc.

MATERIAL
&
PHYSICAL SCIENCES

PAPER ID-186

Curaua Fibers Reinforced PBS-based Composites

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Abstract

Enzymatically treated curaua fibers reinforced biodegradable poly(butylene succinate) (PBS)-based composites were prepared in this study. Cellulase and pectinase were used for the enzymatic treatment of curaua fibers. Untreated and enzymatically treated curaua fibers were characterized in terms of ATR FT-IR, thermal stability (TGA), crystallinity (XRD) and surface morphology (SEM). The composite characteristics were investigated by mechanical tests (tensile and flexural resistance), thermal stability, and SEM micrographs of the fractured surfaces. Enzymatic treatments resulted in a significant change in the morphology of curaua fibers, while their thermal stability and crystallinity were not affected much. SEM investigation of tensile fractured composite surfaces showed strong adhesion between curaua fibers and matrix.

PAPER ID-187

Improvement in electric properties of Gd doped Mg Ferrite

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Abstract

The excellent combination of electric resistivity, relative loss factor and dielectric loss factor of Sm-Mg ferrites can be used to fulfill the future demand for high-frequency applications. Micro structural properties of Sm doped Mg ferrite has been studied with XRD and SEM. All the samples can be indexed as the single-phase cubic spinel structure. The morphology and the size of particles were checked by SEM. The dc electrical resistivity has been increased as compared to $MgFe_2O_4$ ferrite. Sm-Mg ferrite has been investigated for micro structural, electric and dielectric properties. The value of dielectric loss factor has been increased due to the replacement of Fe^{3+} ions by Gd^{3+} ions in Mg ferrite. Higher value of dc resistivity (107Ω-cm) and low values of the relative loss factor of the order of 10^{-5} in the frequency range 0.1–30 MHz are also the cardinal achievements of the present investigation. The mechanisms responsible to these results have been discussed in detail in this paper.

PAPER ID-188

Random interstratification of antimonene with V_2CT_x MXene: An electrode material with superior charge storage characteristics

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Abstract

Self-agglomeration and restacking of MXene layers limits their application in energy storage owing to reduced active sites availability to electrolyte ions. Thus, enhancing the number of electroactive sites in MXene while maintaining its structural stability still remains a challenge. To overcome this, we have utilized conducting and hydrophilic antimonene as a spacer in-between MXene nanosheets resulting in a heterostructure with abundant electroactive sites (1.35 mmol g^{-1} @ 5 mV s^{-1}) and enlarged electroactive surface area (ECSA~990 m^2g^{-1}). MXene/antimonene composite manifests high specific capacitance of 568 F g^{-1} @ 2 A g^{-1}. To verify practical application of the fabricated electrode in energy storage, a symmetric cell was assembled in 1.0 M H_2SO_4 that delivered an energy density of 22.5 Wh Kg^{-1} @ 473.4 W Kg^{-1}. Charge storage characteristics of symmetric device are well maintained with only a 11 % degradation in specific capacitance after 10000 GCD cycles @ 5 A g^{-1}. The current study can be extended to other MXene based nanocomposites for high-performance portable electronics applications

PAPER ID-189

Comparison of electrical and dielectric properties of Ho/Y ions on Ba-Co-Sr nanohexaferrites

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Abstract

A series of Ba-Sr nanohexaferrites with the composition $Ba_{1.5}Sr_{1.5}Co_{2-z}Ho_zMn_xNi_yFe_{24-x-y}O_{41}$ and $Ba_{1.5}Sr_{1.5}Co_{2-z}Y_zMn_xNi_yFe_{24-x-y}O_{41}$(z = 0.0, 0.05,0.10, 0.15, 0.20) were prepared by formation of sol gel followed by auto combustion technique. The DC electrical resistivity of Ho-Mn-Ni substituted samples at room temperature was decreased from 7.09×10^7 (Ω-cm) to 0.301×10^7 (Ω-cm) and the drift mobility increased from 3.76×10^{-12} (cm^2/V-s) to 1.10×10^{-10}(cm^2/V-s) with the increase of Ho^{3+} ion concentration in Ba-Sr hexaferrite samples. A similar trend is followed by Y-Mn-Ni substituted samples with lesser values for each electric parameter. The activation energy of was calculated using electrical resistivity data for both series. Dielectric properties of the prepared nanohexaferrites were investigated by varying frequency at room temperature. Dielectric constant and loss tangent were observed to decrease with an increase in frequency whereas AC conductivity attains a nearly constant value at lower frequency and observed to increase at higher frequencies with the addition of dopants.

PAPER ID-190

A Green Chemistry Embraced Route for Synthesis of Magnetically Separable Metal Oxide Nanoparticles Using Himalayan Medicinal Plants for Organic Transformations

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Abstract

Western Himalayan plants, renowned for their diverse phytochemical composition, offer a sustainable and environmentally friendly approach to the synthesis of metal oxide nanoparticles (NPs). Various parts of the plants like flowers, leaves, stems and roots have been used as the extract for synthesis of metal oxide nanoparticles, where the same has acted as capping and stabilizing agents for the nanoparticles and hence expels various advantages for the metal oxide nanoparticles. The use of these green capping agents thus guides a path for green chemistry-based metal nanoparticle synthesis, avoiding the use of harsh conditions, pH maintenance and external capping agents. Several studies are showing the biological activities of biogenic metal oxide nanoparticles but very less studies for organic reactions are present in literature. We have explored the potential of Himalayan medicinal plants as biogenic sources and investigated the application of these green metal oxide NPs in various organic transformations. A variety of plant extracts (leaves, flowers, stems, roots), including those from Aconitum heterophyllum, Berberis lycium, and Podophyllum hexandrum has been used to reduce metal ions (e.g., silver, gold, zinc etc.) into their corresponding NPs. The green synthesis process eliminates the use of toxic chemicals and provides NPs with unique properties, such as smaller size, enhanced stability, and improved catalytic activity. The synthesized NPs were characterized using techniques like UV-visible spectroscopy, X-ray diffraction, and transmission electron microscopy etc. Their catalytic performance was evaluated in various organic reactions. The results demonstrated that the biogenic NPs exhibited excellent catalytic efficiency and selectivity, surpassing traditional chemical catalysts.

PAPER ID-191

Metal Organic Frameworks for Electrochemical Sensing Devices

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Abstract

Metal organic framework i.e., MOF, is a class of material which have captivated the interest of researchers because of its unique structural chemical traits. Their structure consists of well-organized framework of organic ligands which entraps metal nodes within the cavities of the framework matrices. These materials offer large surface area with well-organized porous structure. These materials are highly tunable, because the nodes of the MOFs can consist of wide variety of metal cations. Due to their high tuneability and versatilities these materials are being tested for various applications. As most of these materials are of insulating nature, they could be utilized for the sensing application based on conduction, allowing their usage in electrochemical based sensors. Their sensing ability further extend to environmental sensing, biochemical and chemical sensing. These materials have shown potential for sensing neurochemicals like glucose, based on their electrochemical behavior. In recent years, the sensing abilities of MOFs has been realized and there are various studies showing the usefulness of the MOFs in sensing applications. In light of these studies, for this review, we will be discussing various types of MOFs being used in electrochemical sensing, their synthesis and the factors determining their sensing ability. This study would provide a comprehensive comparison of the recent studies in this area while also comparing the sensing behavior of MOFs with other materials, leading to better understanding the role of MOFs in advance sensing applications.

PAPER ID-192

An Ethical Dilemma of Three Parent Baby

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Abstract

MXenes represent a class of 2D transition metal carbides, nitrides, and carbonitrides with exceptional properties, indicating their potential in diverse applications. They show high electrical conductivity, hydrophilicity, substantial specific surface area, and chemical versatility, distinguishing them from other nanomaterials. These attributes make them particularly suitable for environmental sensing, enabling their utilization in electrochemical sensors for the detection of hazardous pollutants such as heavy metals, pesticides, and organic compounds. This review examines recent developments in MXene-based nanocomposites for environmental pollutant detection, emphasizing their synthesis, integration in biosensors, and prospective challenges in the domain. Principal subjects encompass the fabrication of MXene based electrochemical sensors, their utilization in pollutant detection, and addressing challenges like MXene restacking and stability. This review provides a significant resource for the research community, presenting insights into the potential of MXene materials to enhance the sensitivity and efficiency of environmental sensors, while directing future innovations in sustainable environmental monitoring.

PAPER ID-193

Sustainable and Highly Efficient Photocatalytic Remediation of Water Pollutants Using green synthesized ZnMn2O4 Nanoparticles Incorporated into Psyllium-carboxymethylcellulose gel

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Abstract

The global attention on the widespread usage, toxicity, and bioaccumulation of BPA has led to a demand for an efficient approach for its removal. The main emphasis of our research is the photocatalytic elimination of BPA from wastewater, employing Psyllium-carboxymethylcellulose gel (PsyCMC gel) coated $ZnMn_2O_4$ nanocomposite. The nanocomposite was characterized by the PXRD, FESEM, FTIR, XPS, ZETA potential. Under optimum conditions (nanocomposite quantity: 25 mg; concentration of pollutants: 120 mgL^{-1}; acidic pH, exposure to sunlight), rapid degradation of BPA (up to 93%) was reported. The small crystallite size (10.95 nm), narrow bandgap (2.3 eV), and more negative value charge (-25.7 mV) of PsyCMC@$ZnMn_2O_4$ nanocomposite support its outstanding photocatalytic efficiency. Scavenger study has indicated that the hydroxide radical plays a vital function in breaking down potentially harmful contaminants into safer by-products. GC-MS analysis verified that PsyCMC@$ZnMn_2O_4$ nanocomposite efficiently decomposes complex and harmful pollutants into safer metabolites when exposed to natural sunlight. The prepared nanocomposite has considerable potential due to its stability, charge separation, cost-effectiveness, and reusability up to eight consecutive cycles without losing efficiency.

PAPER ID-194

Exergy-Based Performance Evaluation of Solar Tower Systems: A Comprehensive Review of Methods and Applications

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Abstract

Solar tower systems, a key technology in concentrated solar power, offer significant potential for sustainable energy generation. However, evaluating their performance requires more than conventional energy analysis. Exergy analysis, which accounts for the quality and usability of energy, provides a deeper insight into the efficiency and thermodynamic optimization of solar tower systems. This review presents a comprehensive analysis of the methods and applications of exergy evaluation in solar tower systems, highlighting the various approaches used to assess exergy efficiency, losses, and destruction in different system components such as heliostats, receivers, thermal storage, and power conversion units. The paper synthesizes existing literature on both theoretical and experimental studies, comparing the exergy-based performance of different configurations, materials, and operational conditions. Key findings reveal that optimizing exergy efficiency is crucial for minimizing irreversibility and maximizing system performance. The review also discusses emerging trends in solar tower technology, innovative exergy-based optimization methods, and future research directions, emphasizing the role of exergy analysis in improving the sustainability and economic viability of solar tower systems. By providing a comprehensive overview of current methods and applications, this paper aims to serve as a reference point for researchers and engineers seeking to enhance the exergy performance of solar power systems.

PAPER ID-195

Recent advancements in carbon-based material for Bio-sensing devices

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Abstract

Carbon based material are the type of materials having carbon arrangement in different structural arrangement. Some of the mostly researched carbon materials consists of, graphene, carbon nanotubes and fullerenes. The unique properties of carbon materials make them suitable for different research areas. They generally show high electrical and thermal conductivity, good chemical stability and large surface. They are also being studied for their biocompatibility, and sensing abilities. Biosensing applications involve the detection and measurement of biological molecules, pathogens, or biochemical processes using sensors that convert biological responses into measurable signals. These applications play a crucial role in various fields, including medical diagnostics, environmental monitoring, and food safety, offering fast, sensitive, and selective detection methods. Carbon-based materials improve the electron transfer between biomolecules and electrodes, resulting in higher signal-to-noise ratios and lower detection limits. Additionally, their versatility allows for functionalization with biomolecules such as enzymes, antibodies, or DNA, further enhancing the specificity and selectivity of the sensors. This review highlights the latest developments in carbon-based materials for biosensing devices, emphasizing their benefits in terms of sensitivity, selectivity, and rapid detection. The advancements in this area hold great promise for the future of bio-sensing technologies

PAPER ID-196

Role of Nanocomposites in water treatment

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Abstract

Nanocomposites play a significant role in water purification due to their unique physical, chemical, and biological properties. Their nanostructures provide enhanced surface area, reactivity, and selectivity, making them highly effective in removing various contaminants, such as heavy metals, organic pollutants, and microorganisms. Nanocomposites can adsorb toxic heavy metals (e.g., lead, mercury, arsenic) from water due to their high surface area. The incorporation of materials like graphene oxide or carbon nanotubes into the composite improves adsorption efficiency. Nanocomposites, especially those involving materials like titanium dioxide (TiO_2), exhibit photocatalytic properties under UV or visible light, breaking down organic pollutants such as pesticides, pharmaceuticals, and dyes into less harmful substances. Nanocomposites containing silver, copper, or zinc nanoparticles possess strong antimicrobial properties, helping in the disinfection of water by killing bacteria, viruses, and other pathogens. Nanocomposite 'membranes enhance filtration processes by improving mechanical strength, permeability and fouling resistance. These membranes can be used for ultra filtration, nanofiltration, and reverse osmosis, removing particles, salts, and organic pollutants from water. Nanocomposites can catalyze the breakdown of complex contaminants into less harmful forms through catalytic degradation, for example, iron oxide Nanocomposites are effective in breaking down persistent organic pollutants (POPS) through Fenton-like reactions. Some nanocomposites are designed to selectively remove specific ions from water, such as fluoride, nitrate, or phosphate, providing targeted purification for contaminated water sources. Overall, Nanocomposites are at the forefront of developing efficient, sustainable, and low-cost technologies for water purification, offering improvements over traditional methods. Their versatility allows them to be applied in various water treatment systems, from industrial wastewater treatment to portable purification devices for rural areas.

PAPER ID-197

Y-Zeolite supported coupled semiconductor for water purification

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Abstract

Y-Zeolite-supported coupled semiconductors for water purification represent an innovative approach in the field of environmental remediation, particularly for the removal of contaminants from water. This concept integrates the adsorption properties of Y-Zeolite with the photocatalytic activity of semiconductors, enhancing the overall efficiency of water purification systems. Y-Zeolite is a crystalline aluminosilicate material with a high surface area and porosity, making it ideal for adsorption. Its framework contains cavities and channels that can trap pollutants such as heavy metals, organic molecules, and various toxins. Due to its large pore size and hydrophilic nature, Y-Zeolite can adsorb various pollutants from water, such as organic dyes, heavy metals, and harmful chemicals. This provides an initial stage of pollutant removal. Semiconductors like titanium dioxide (TiO_2), zinc oxide (ZnO), or tungsten trioxide (WO_3) are often used for their photocatalytic properties. When these materials are exposed to light (usually UV or visible light), they can generate electron-hole pairs, leading to the production of reactive oxygen species (ROS) such as hydroxyl radicals, superoxide anions, or singlet oxygen. Coupling two different semiconductors improves charge separation and reduces electron-hole recombination, enhancing photocatalytic efficiency. For example, TiO_2 coupled with ZnO or WO_3 can extend the absorption range of light and improve degradation of pollutants. Y-Zeolite acts as an adsorbent, capturing pollutants on its surface, where the coupled semiconductors can then degrade them through photocatalysis. This synergy between adsorption and degradation improves overall purification.The combination allows for simultaneous adsorption (by Y-Zeolite) and degradation (by semiconductors), effectively tackling both organic and inorganic pollutants.These materials are often stable and can be reused for multiple cycles of water purification, reducing the cost of treatment. Y-Zeolite's strong adsorption capability enables it to trap heavy metals like lead (Pb), mercury (Hg), and cadmium (Cd). The ROS generated during Photocatalysis can kill harmful microorganisms, contributing to water disinfection. The effectiveness of the semiconductors depends on the availability of suitable light sources, which may not always be cost-effective or sustainable. Scaling up such systems for large water bodies or industrial applications requires further research to optimize efficiency and minimize costs.

PAPER ID-198

HIGH FREQUENCY ELECTRICAL AND DIELECTRIC PROPERTIES OF La^{3+}/Ni^{2+} SUBSTITUTED $Sr_2Co_2Fe_{12}O_{22}$ Y-TYPE HEXAFERRITES

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Abstract

A series of composite y-type ferrites were derived by fabricating $Sr_{2-x}La_xCo_2Ni_yFe_{12-y}O_{22}$ with doping of and La^{3+} / Ni^{2+} (x = 0.0, 0.010, 0.020, 0.030, 0.04 and y = 0.0, 0.1, 0.2, 0.3, 0.4) respectively by using sol-gel method. The room temperature dc resistivity was observed to increase and was found to decrease with the increase in temperature for each sample. The observed values of activation energy for the fabricated materials showed the same trend like RT resistivity. The dielectric study was done for the frequency (20 Hz – 120 MHz). Dielectric constant of synthesized samples decreased with the increase in the concentration of contents. All the samples showed the resonance peaks. Surface charge polarization is responsible for the high values of dielectric constant and dielectric loss factor at lower frequency. The increase in RT dc resistivity and small dielectric loss makes these materials more effective for those devices requiring high resistive materials and in high frequency applications.

PAPER ID-213

The Impact and Significance of Wi-Fi Networks security & threats in Modern Society

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Abstract

Due to the widespread usage of computers and other smart electronics these days, wireless networks are widely available and widely used in a variety of settings, including banks, offices, restaurants, cafes, homes, and airports. Electronic devices with network sensors that enable them to connect to a wireless LAN can access wireless networks. Due to its extraordinary dynamic nature and broad breadth, Internet security, also known as network security, is a hot topic that is crucial to our society's communication infrastructure. For this reason, a lot of businesses and institutions make significant investments in highly skilled professionals and specialized infrastructure protection. Vigilance over the network equipment is necessary to achieve the goal of security monitoring and shielding the network from cyber threats. Wireless networks are essential for making our daily lives easier and for relying on the internet for everything. They have completely transformed the way we communicate and exchange information by reducing distance and location. We attempt to investigate the WEP protocols and the 802.11 standard for wireless networks in this research. Beside the general security goals of confidentiality, integrity, availability.

PAPER ID-214

DFT investigations of novel RbVSb half-Heusler alloys for energy harvesting applications

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Abstract

In this study we have investigated the robust phase stability, elasto-mechanical, thermophysical and magnetic response of RbVSb half Heusler compounds by implementing density functional theory (DFT) models in WIEN2k simulation package. The dynamic phase stability is computed in phase type I, II & III phase configurations by optimising their energy. It is observed that given compound is more stable in spin-polarized state of phase type-III. To explore the electronic band structure, we apply the generalised gradient approximation along with Hubbard potential U. The electronic band profile of the Heusler alloy display a half-metallic nature. Moreover, the calculated second-order elastic parameters divulge the brittle nature. To understand the thermo dynamical and thermoelectric stability of the alloy at various temperature and pressures ranges Quasi-Harmonic Debye model is executed successfully. The computed value of magnetic moment (MM) found in good agreement with Slater-Pauling rule. Our findings confirm that the predicted half Heusler alloy can be used in various energy harvesting applications.

PAPER ID-215

DFT investigations of novel RbVSb half-Heusler alloys for energy harvesting applications

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Abstract

In this study we have investigated the robust phase stability, elasto-mechanical, thermophysical and magnetic response of RbVSb half Heusler compounds by implementing density functional theory (DFT) models in WIEN2k simulation package. The dynamic phase stability is computed in phase type I, II & III phase configurations by optimising their energy. It is observed that given compound is more stable in spin-polarized state of phase type-III. To explore the electronic band structure, we apply the generalised gradient approximation along with Hubbard potential U. The electronic band profile of the Heusler alloy display a half-metallic nature. Moreover, the calculated second-order elastic parameters divulge the brittle nature. To understand the thermo dynamical and thermoelectric stability of the alloy at various temperature and pressures ranges Quasi-Harmonic Debye model is executed successfully. The computed value of magnetic moment (MM) found in good agreement with Slater-Pauling rule. Our findings confirm that the predicted half Heusler alloy can be used in various energy harvesting applications.

PAPER ID-216

Synthesis of nanoparticles using Green synthesis method

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Abstract

Nanoparticles are materials where dimensions range between 1 and 100 nm. The compact surface area gives more accessibility for enhanced surface functionality with specific volume. Green synthesis of nanoparticles involves the use of plants or plant parts for the bio reduction of metal ions into their elemental form in the size range 1-100nm.The green synthesis methods used are microbial synthesis in which microbial cells like bacteria, yeast and fungi are used to synthesize nanoparticles from metallic salts. Other methods include plant mediated synthesis in which plants are connected to different types of nanotechnology, hydrothermal synthesis method in which chemical reaction that takes place under low humidity and closed conditions which prevent the volatilization of harmful components, ultrasound assisted photosynthesis in which a rapid synthesis process that produces iron oxide nanoparticles with higher antioxidant and antimicrobial activity, and colloidal aqueous sol-gel process uses small amounts of chemicals, water as a solvent and a low temperature for crystallization to produce crystalline nanoparticles.

PAPER ID-217

Entropic Squeezed States of PT-Symmetric Potential

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Abstract

In recent years, Shannon information theories have attracted unprecedented attention because of many applications in different fields like computer science, biology, medicine, chemistry, nanotechnology, mathematical physics and atomic physics. They have potential implications to study the fundamental concepts of quantum mechanics and are key ingredients in the study of quantum computation and modern communication technologies. PT-symmetric Quantum Mechanics is playing an extrusive role in effectual understanding of some distinguished problems in high energy physics, optics, quantum chemistry and nanotechnology. The characteristic features of information density and their properties are thoroughly analyzed. The information entropy in position and momentum space is obtained and Bialynicki-Birula and Mycielski inequality is saturated for various parameters of the potential. Some interesting features of information entropy have been discussed. The variation in position and momentum space information entropy has been described which gets saturated for specific values of the parameter. Further, the eigenfunctions and their Fourier transforms have been used to analyze the squeezing phenomenon in PT-symmetric and PT-breaking case of the potential. The entropy squeezing has been realized in position space and momentum space of the potential respectively. The uncertainty reduction in position quadrature below the value of vacuum occurs at the cost of an increase in the momentum quadrature. It is a result of great importance as the uncertainty product numerically saturates for higher values of the parameter. It is interesting to observe the position space entropy squeezing in PT symmetric case whereas there exhibit momentum space entropy squeezing when the symmetry is broken. We speculate that this phase transition is analogous to the transition from normal to superconducting phase and paramagnetism to ferromagnetism.

PAPER ID-218

Analysing the potential of ferrites for electrochemical sensing applications

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Abstract

Ferrites are amongst the most studied materials, due to their tuneable magnetic and structural traits. This allows for their use in different applications. But in recent years their potential in sensing applications has been realised. Increasing number of studies are coming out each year, analysing different types of ferrites for the sensing applications. Their distinct magnetic, electrical and physical traits allow them to be used in different types of sensing applications. In this review, we will go through the basic mechanism of sensing using ferrites, while also covering different types of ferrites for the sensing applications. The mechanism behind the sensing behavior of the ferrites will also be discussed. This review will provide concise and comprehensive review of recent literature regarding the sensing applications of ferrite while also addressing the existing area of improvement. Through this critical analysis, we seek to offer valuable insights into current research and inspire future innovations in ferrite-based glucose sensing technologies.

PAPER ID-219

A review on Lithium-ion batteries: an emerging technology

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Abstract

Lithium-ion batteries are the class of rechargeable batteries that have become integral to modern technology, powering a wide array of devices from smart phones and laptops to EV's and grid storage systems. They are favored for their high energy density, low self-discharge rate and long cycle life compared to other battery technologies. Lithium-Ion batteries operate through the movement of Li-ions between the anode and cathode, typically composed of graphite and a Li metal oxide, respectively. Advances in material science have led to significant improvements in LIB's performance, including enhanced capacity, safety and charging speed, Despite their advantages LIB; s face challenges such as thermal stability, limited resource availability and environmental impact. Research efforts are focused on developing next generation materials such as solid-state electrolytes and silicon-based anodes, to address these limitations. The ongoing development of LIB's is critical for the transition to sustainable energy solutions and the advancement of portable electronic technologies. The present work highlights the overview of Lithium-ion batteries in details and also provide the solution to enhance the properties of LIBs with hybrid materials in future.

PAPER ID-237

DFT Investigations of Novel CsVZ (Z=Sn,Sb) Half-Heusler Alloys for Energy Harvesting Applications

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Abstract

Half-Heusler (HH) alloys are promising materials for thermoelectric and energy harvesting applications due to their tunable electronic, thermal, and structural properties. In this study we have investigated the robust phase stability, elasto-mechanical, thermophysical and magnetic response of CsVZ (Z=Sb, Sn) half-Heusler compounds by implementing density functional theory (DFT) models in WIEN2k simulation package. The dynamic phase stability is computed in phase type I, II & III phase configurations by optimising their energy. It is observed that given compound is more stable in spin-polarized state of phase type-III. To explore the electronic band structure, we apply the generalised gradient approximation along with Hubbard potential U. The electronic band profile of the Heusler alloy display a half-metallic nature. Our DFT calculations reveal that CsVZ (Z=Sb, Sn) alloys adopt a stable cubic Half-Heusler structure, with optimized lattice parameters comparable to other known thermoelectric materials. The electronic band structure analysis shows that both alloys exhibit semiconducting behaviour, with band gaps in the range of 0.5–1.0 eV, suitable for thermoelectric applications. The projected density of states (DOS) indicates significant contributions from Ru and V d-orbitals, which influence the electronic transport properties. Moreover, the calculated second-order elastic parameters divulge the brittle nature. To understand the thermo-dynamical and thermoelectric stability of the alloy at various temperature and pressures ranges Quasi-Harmonic Debye model is executed successfully. The computed value of magnetic moment (MM) found in good agreement with Slater-Pauling rule. The study highlights the potential of CsVZ (Z=Sb, Sn) Half-Heusler alloys in thermoelectric generators and other energy conversion technologies. It will also focus on experimental validation, optimization of material properties through doping and nano-structuring, and the development of scalable synthesis methods. Our findings confirm that the predicted half Heusler alloy can be used in various energy harvesting applications and position these alloys as valuable materials for sustainable energy solutions.

PAPER ID-220

Dielectric and Impedance Investigations of Lanthanum-doped Barium Zirconate Titanate (La-doped BZT)

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Abstract

In the present work, we have investigated the influence of Lanthanum (La^{3+}) doping on the dielectric properties and impedance analysis of Barium Lanthanum Zirconate Titanate perovskite system $Ba_{1-x}La_xZr_{0.15}Ti_{0.85}O_3(0.01 \leq x \leq 0.10)$ ceramic samples have been prepared by solid state reaction method. X-ray diffraction analysis revealed sharp peaks of $Ba_{1-x}La_xZr_{0.15}Ti_{0.85}O_3(0.01 \leq x \leq 0.10)$ indicate crystalline nature of the samples and formation of single-phase cubic perovskite structure. Furthermore, scanning electron microscopy examinations confirmed uniformity of surface morphology of the samples. The dielectric properties of $Ba_{1-x}La_xZr_{0.15}Ti_{0.85}O_3(0.01 \leq x \leq 0.10)$ have been investigated over wide range of frequencies and temperature, demonstrating high dielectric permittivity at low frequencies with subsequent decrease as frequency increases. The variation of tangent loss with frequency and temperature exhibits high values at low frequency and dispersion at higher frequency. The Curie temperature (T_c) shifts towards higher temperature for lower La concentration. This shifting of Tc signals towards relaxation type of dielectric polarization. the phase transition is more diffusive and exhibit relaxor behaviour when BZT is doped with higher concentration of La^{3+}. Complex impedance spectroscopy has been explained by the Nyquist plot for all the samples.

PAPER ID-253

Synergistic Effects of Ni Doping in MnO2 Nanorods: Structural and Electrochemical Insights for High-Performance Supercapacitors

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Abstract

Supercapacitors are the future of electric vehicles (EVs) because of their high-power density but due to low energy density they are not frequently used in EVs. So, researchers are continuously putting their efforts to improve their energy density. In the present study we investigated Nickel Doped MnO_2 (Ni-MnO_2) Nanorods. Ni-MnO_2 has been synthesized by using hydrothermal methods. The Successful confirmation of Ni-MnO2 has been achieved through X-ray Powder Diffraction (XRD), and Field Emission Scanning Electron Microscopy (FE-SEM) confirms its nanoroad shape morphology. The Electrochemical performance of Ni-MnO_2 has been checked with 6M Potassium Hydroxide (KOH) in a wide potential window. We prepared Ni-MnO_2 at different weight percentages of Ni i.e. 2%, 5%, and 7%. The best performance has been observed at 5 % weight percentage, exhibiting a specific capacitance 336 F/g, energy density 31.7 Wh/kg and power density 450 kW/kg. Material promises a good cyclic stability (capacitance retention 71.8% after 2000 cycles at $1Ag^{-1}$) and columbic efficiency (90.8%). A device was fabricated to check the performance of material which glow the red LED.

PAPER ID-254

Thermoluminescence studies of double rare earth doped strontium pyrophosphate prepared by slow evaporation method

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Abstract

Double Rare Earth doped Strontium Phosphate phosphor is prepared with varying temperature by using slow Evaporation method keeping its thermoluminescence properties in mind. X-Ray diffraction (XRD) and Photoluminescence (PL) techniques are utilized to confirm the structure of host as well as activators. Thermoluminescence (TL) studies of this prepared material is carried out for varying temperature as well as varying the quantity of rare earths activators and which shows that Dy and Eu doped $Sr_2P_2O_7$ exhibit very significant thermoluminescence glow peaks, suggesting this could be promising dosimetric materials.

PAPER ID-255

Dielectric and electric properties of Gd doped Mg Ferrite

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Abstract

The excellent combination of electric resistivity, relative loss factor and dielectric loss factor of Gd doped ferrites can be used to fulfil the future demand for high-frequency applications. Micro structural properties of doped Mg ferrite has been studied with XRD and SEM. All the samples can be indexed as the single-phase cubic spinel structure. The morphology and the size of particles were checked by SEM. The dc electrical resistivity has been increased as compared to $MgFe_2O_4$ ferrite. Gd-Mg ferrite has been investigated for micro structural, electric and dielectric properties. The value of dielectric loss factor has been increased due to the replacement of Fe^{3+} ions by Gd^{3+} ions in Mg ferrite. Higher value of dc resistivity (10^7 Ω-cm) and low values of the relative loss factor of the order of 10^{-5} in the frequency range 0.1–30 MHz are also the cardinal achievements of the present investigation. The mechanisms responsible to these results have been discussed in detail in this paper.

PAPER ID-256

Nanostructured Boron Carbon Nitride as a Promising Candidate for Boron Neutron Capture Therapy

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Abstract

Boron Neutron Capture Therapy (BNCT) is a promising targeted radiotherapy technique that utilizes 10B-enriched compounds to selectively treat cancer cells. In this study, nanostructured boron carbon nitride (BCN) has been synthesized via a simple solvothermal method and explored as a potential boron compound for BNCT applications. Structural analysis confirmed the formation of hexagonal BCN with the presence of defect states, while morphological studies revealed a layered structure with a highly porous honeycomb network, which could enhance cellular accumulation for BNCT. The synthesized BCN exhibited a band gap of ~3.85 eV and visible region emission. Cytotoxicity analysis indicated that BCN is relatively non toxic, suggesting its suitability for biomedical applications. A comparative anti-tumor study using HeLa and U-87MG cell lines demonstrated that BCN has greater efficacy than the clinically studied L-BPA compound in in-vitro BNCT experiments. These findings highlight the potential of BCN as a new candidate for BNCT, offering a cost-effective, highly soluble, and efficient boron compound for cancer therapy.

PAPER ID-257

Multifunctional Nano structured aerogel for environment remediation

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Abstract

Multifunctional nanostructured aerogels have emerged as a promising solution for environmental remediation due to their unique properties, such as high surface area, porosity, and lightweight nature. These advanced materials exhibit exceptional adsorption capacities for various pollutants, including heavy metals, organic contaminants, and dyes, making them highly efficient in water and air purification. Furthermore, nanostructured aerogels can be functionalized with different nanomaterials to enhance their photocatalytic, antimicrobial, and catalytic activities, offering a comprehensive approach to pollution management. This study explores the synthesis, characterization, and application of multifunctional aerogels in environmental cleanup, emphasizing their role in sustainable water treatment, air filtration, and soil decontamination. The results demonstrate that these aerogels not only provide effective pollutant removal but also exhibit recyclability and cost-efficiency, positioning them as a viable alternative in addressing global environmental challenges.

PAPER ID-258

Development of Hybrid Nanomaterials for Multi-Functional Coatings: Enhancing Solar PV Panel Efficiency Through Carbon Nanotube and Silica/TiO_2 Composites

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Abstract

This research explores the potential of hybrid nanomaterials, specifically carbon nanotubes (CNTs) combined with silica and titanium dioxide (TiO_2), to create multi-functional coatings for solar photovoltaic (PV) panels. By leveraging the unique properties of CNTs alongside the optical and mechanical benefits of silica and TiO_2, we aim to develop coatings that significantly reduce reflectance while enhancing durability. Our findings demonstrate that these hybrid coatings improve light absorption, mechanical strength, and environmental resistance, thereby enhancing the overall efficiency and longevity of solar PV systems.

PAPER ID-269

Implications of Generalised CP Symmetry and Texture Zero in Trimaximal Mixing Matrix

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Abstract

In this study, we examine the impact of texture zero on the neutrino mass matrix, focusing on constraining the unknown neutrino parameters such as mixing angles, Dirac and Majorana phases, and mass eigenstates. We explore the one-zero texture within the framework of generalized CP symmetry, associated with the complex tribimaximal mixing matrix. By combining these approaches, we derive predictive neutrino mass matrices and investigate neutrino less double beta decay in the context of texture zero. Our analysis considers the implications for current and future experimental searches, emphasizing the enhanced predictability and testability of neutrino mass models that incorporate generalized CP symmetry.

PAPER ID-270

Study of Temperature & Light Dependent Electrical Properties in Au-FeS_2 Thin Films

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Abstract

In this study, Au-FeS_2 thin films were successfully fabricated using thermal evaporation, followed by comprehensive structural, morphological, and electrical characterization. X-ray diffraction (XRD) analysis revealed the amorphous nature of the films, indicated by a broad peak near 25°. Field emission scanning electron microscopy (FESEM) images showed a non-uniform distribution of gold nanoparticles on the FeS_2 surface, with variable particle sizes and degrees of agglomeration. Electrical measurements were conducted under both dark and illuminated conditions. Current-voltage characteristics exhibited Ohmic behavior, with conductivity increasing at higher temperatures. The resistivity of the films decreased with temperature, confirming a thermally activated charge transport mechanism. Activation energies of 0.520 eV (dark) and 0.410 eV (light) were calculated, emphasizing the effect of light on charge transport. Furthermore, the films demonstrated enhanced photoconductivity, with a significant increase in electron-hole pair generation under light exposure. These findings suggest that Au-FeS_2 thin films hold great promise for advanced electronic and optoelectronic applications, particularly in devices where high photoconductivity and temperature-dependent conductivity are essential.

PAPER ID-271

Enhancing Solar Reflectance and Thermal Efficiency of Scheffer Using Alumina Nanoparticles: Synthesis Methods and Applications in Solar Steam Cooking Systems

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Abstract

This study investigates the incorporation of alumina (Al_2O_3) nanoparticles into Scheffer materials to enhance their solar reflectance and thermal efficiency for improved solar steam cooking systems. Various synthesis methods, including sol-gel, hydrothermal, and spray pyrolysis, were employed to produce alumina nanoparticles with tailored properties. The resulting composites were characterized for their structural, optical, and thermal properties. Our findings demonstrate a significant increase in solar reflectance by over 35%, leading to enhanced heat retention and reduced cooking times. This research highlights the potential of alumina nanomaterials in developing efficient, sustainable cooking technologies.