

3rd International Conference on
Recent Advances in Sustainable Environment

November 22 - 23, 2024

Organized by





विश्वविद्यालय प्रौद्योगिकी संस्थान, हिमाचल प्रदेश विश्वविद्यालय, समर हिल, शिमला, भारत

University Institute of Technology, Himachal Pradesh University, Summer Hill, Shimla, India

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An Event of



Editors

Prof. Divya Prakash
Dr. Disha Thakur
Dr. O. P. Verma
Dr. Sanjay Kumar
Dr. Tarun K Sharma

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3rd International Conference on

Recent Advances in Sustainable Environment (RAISE2024)

November 22 – 23, 2024

University Institute of Technology, Himachal Pradesh University, Shimla, India

Editors:

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Objectives and Aims of RAISE-2024

The 3rd International Conference on Recent Advances in Sustainable Environment (RAISE-2024) aims to serve as a premier platform for YOUNG researchers, practitioners, and thought leaders to explore and discuss innovative sustainability solutions across various domains. Organized by Himachal Pradesh University and supported by the STEM-Research Society, the conference will take place on November 22-23, 2024.

Objectives:

- ✓ Knowledge Sharing: To facilitate the exchange of cutting-edge research, practices, and ideas in sustainable environmental solutions.
- ✓ Interdisciplinary Collaboration: To foster collaboration among researchers, industry experts, and policymakers from diverse fields related to sustainability.
- ✓ Innovative Solutions: To highlight novel approaches and technologies that address critical environmental challenges and promote sustainability.
- ✓ Networking Opportunities: To provide a platform for networking and building partnerships among stakeholders dedicated to advancing sustainability initiatives.
- ✓ Capacity Building: To enhance the understanding of sustainable practices and their implementation in various sectors.

Aims:

- ✓ To present and discuss recent advancements and research findings in sustainability across disciplines.
- ✓ To promote dialogue on the practical implications of sustainability solutions and their impact on local and global environments.
- ✓ To encourage participation from young researchers and students, fostering the next generation of leaders in sustainability.
- ✓ To create actionable insights and recommendations that can inform policy and practice in sustainable development.

Through these objectives and aims, RAISE-2024 aspires to contribute significantly to the global discourse on sustainability and inspire collective action towards a more sustainable future.

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Message from the Conveners

Dear Participants,

We are delighted to present the Book of Abstracts for the 3rd International Conference on Recent Advances in Sustainable Environment (RAISE-2024), organized by University Institute of Technology, Himachal Pradesh University, Shimla and supported by the STEM-Research Society. Scheduled for November 22-23, 2024, this conference serves as a vital platform for researchers, practitioners, and students to share their innovative ideas and findings in the field of sustainable environmental practices.

The abstracts compiled in this book reflect a diverse range of topics, showcasing cutting-edge research and advancements that address the pressing environmental challenges of our time. We are grateful to all contributors for their valuable insights and dedication to sustainability.

We hope that this collection inspires fruitful discussions, collaborations, and a deeper commitment to fostering a sustainable future. We encourage you to engage actively during the conference, share your perspectives, and network with fellow attendees.

Thank you for your participation, and we look forward to an inspiring and productive conference!

Warm regards,

Editors

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HIMACHAL PRADESH UNIVERSITY
(NAAC ACCREDITED 'A' GRADE UNIVERSITY)
UNIVERSITY INSTITUTE OF TECHNOLOGY (UIT)
SUMMER HILL, SHIMLA-171005
E-mail: uiitofficehpu@gmail.com , Ph.: 0177-2832571

Dated: 07.11.2024



Prof. S. P. Bansal
Vice Chancellor

From Vice Chancellor's Desk

I am pleased to note that the Department of Civil Engineering, University Institute of Technology (UIT), Himachal Pradesh University is hosting a **"3rd International Conference on Recent Advances in Sustainable Environment (RAISE 2024)"** in association with STEM Research Society on the 22nd and 23rd November 2024. Such an event brings together researchers and students on a single platform and fosters a research-driven culture across the academic community, contributing to the nation's educational advancement.

Organizing such an event reinforces the objective of developing an environment for the exchange of ideas toward technological developments. I wish the conference would be able to deliberate on current issues of national and international relevance particularly in the fields of renewable energy, agriculture, construction, civil engineering, etc., and the application of AI for sustainable environment and sustainable development. This conference is bound to inspire innovative ideas among its participants, paving the way for breakthroughs in sustainable technology.

I welcome all the delegates and participants to this conference coming from near and far. I convey my warm greetings to the Department of Civil Engineering for organizing the conference. I congratulate the Director, organizing members, faculty, and students of the University Institute of Technology for successfully organizing this event.

I wish the conference a great success.

Prof. S.P. Bansal
Vice Chancellor
HPU Shimla

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Dated: 07.11.2024



Prof. Rajinder Verma
Pro Vice Chancellor

From Pro Vice Chancellor's Desk

It is quite gratifying to know that the Department of Civil Engineering, University Institute of Technology (UIT), Himachal Pradesh University (HPU) Shimla, is hosting **"3rd International Conference on Recent Advances in Sustainable Environment (RAISE 2024)"**, during 22-23, November 2024 in association with STEM-Research Society, India.

I fervently believed that this conference will boost the quality of the research and more collaborations in future. The conference offers a premise for global experts to gather and interact intensively on the topics of renewable energy, environmental engineering, civil infrastructure, AI and Machine learning etc. for sustainable development.

I believe that this International Conference **RAISE-2024,** will provide a platform to discuss the research outcomes critically and come up with effective solutions as well as establish a good collaboration between universities and industrial firms located nationally and internationally.

I convey my warm greetings and felicitations to the organizing committee and all staff members of the University Institute of Technology (UIT) for organizing this conference successfully.

My best wishes for the success of the conference.

Prof. Rajinder Verma
Pro Vice Chancellor
HPU Shimla

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Dated: 07.11.2024



Prof. A. J. Singh
Director

From Director's Desk

I am pleased to welcome you all to the **"3rd International Conference on Recent Advances in Sustainable Environment (RAISE 2024)"**, organized by the University Institute of Technology (UIT), Himachal Pradesh University (HPU) Shimla, Himachal Pradesh during 22-23, November 2024 in association with STEM-Research Society, India.

UIT is a premier institution of excellence in engineering and technology that develops highly caliber professionals and leaders imbued with values of entrepreneurship, ethics, and social responsibility. The events at this conference are targeted toward researchers, practitioners, professionals, educators and students to share their experiences, innovative ideas, issues, recent trends and future directions in Engineering, Science and Technology.

This conference is a unique forum for the exchange of innovative ideas, technical expertise for technological advancements, etc. in this evergreen field. It includes keynote addresses from academicians and paper presentations by research scholars. It is a matter of joy for us to welcome the participants to this conference. My best wishes to all participants to make the most out of this event by learning innovative and advanced technologies.

I extend my best wishes to the organizers as well as the delegates and wish the conference all the success.

A. J. Singh

Prof. A. J. Singh
Director, UIT

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हिमाचल प्रदेश विश्वविद्यालय Himachal Pradesh University

A State Government University Accredited with 'A' grade by NAAC

University Institute of Technology

Dated: 05.11.2024

Message

Dear Participants,

Welcome to the Book of Abstracts for the 3rd International Conference on Recent Advances in Sustainable Environment (RAISE-2024)! We are thrilled to gather scholars, researchers, and practitioners from around the globe at the University Institute of Technology, Himachal Pradesh University, on November 22-23, 2024. This collection of abstracts highlights the diverse range of research and innovative practices being explored in the field of sustainability. Each submission reflects the dedication and creativity of contributors who are striving to address critical environmental challenges. From advancements in renewable energy to sustainable agricultural practices and beyond, the work showcased here is vital to fostering a healthier planet. I would like to extend my sincere gratitude to all the authors for their valuable contributions, as well as to the organizing committee and our partners at the STEM-Research Society for their unwavering support. Together, we aim to facilitate discussions that inspire collaboration and drive impactful solutions for a sustainable future. As you explore the abstracts, I encourage you to engage with the authors, share insights, and foster connections that can lead to fruitful partnerships. Your participation is crucial in advancing the dialogue around sustainability and creating a lasting impact in our communities.

Thank you for being a part of RAISE-2024. Let us work together towards a more sustainable and resilient world.

Best regards,

Dr. Disha Thakur

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University Institute of Technology

Dated: 05.11.2024

Message

It is with great pleasure that I welcome you to the Book of Abstracts for the **3rd International Conference on Recent Advances in Sustainable Environment (RAISE2024)**, hosted by the *University Institute of Technology*, **Himachal Pradesh University**, and supported by the **STEM-Research Society**. This conference provides a vital platform for scholars, practitioners, and policymakers to engage in meaningful discussions and share ground breaking research on sustainability. The abstracts collected in this volume reflect the innovative ideas and diverse perspectives that contribute to the advancement of sustainable practices in our rapidly changing world. We are proud to showcase the work of researchers who are at the forefront of addressing pressing environmental challenges, ranging from renewable energy solutions to sustainable resource management. Each abstract represents a commitment to fostering a sustainable future and highlights the collaborative spirit that drives our community.

I extend my heartfelt thanks to all participants for their contributions and to the organizing committee for their tireless efforts in bringing this conference to fruition. I hope that the discussions and exchanges during RAISE2024 inspire new ideas and partnerships that will lead to impactful solutions.

Thank you for joining us in this important endeavour. Together, let us strive for a sustainable and resilient environment. I extend my best wishes to the organizers as well as the delegates and wish the conference all the success.

Dr. Sanjay Kumar
UIT HPU Shimla

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List of Accepted Papers

Paper ID	Title of the Paper	Author(s)
A01	Brief Review of Drilling of Carbon Fibre/Reinforced Polyetheretherketone (CF/PEEK) Composites	Necdet Yakut[1], Orhan Çakır[2] [1]Department of Machinery, Istanbul Aydın University, Istanbul, Turkiye; [2]Department of Mechanical Engineering, Yildiz Technical University, Istanbul, Turkiye
A02	Examination of Punch Tip Wear Angle On Sheet Metal Cutting Process	Ümit Aldemir, Orhan Çakır Department of Mechanical Engineering, Yildiz Technical University, Istanbul, Turkiye
A03	Sustainability Through Process Improvements in Photochemical Machining	Orhan Çakır Department of Mechanical Engineering, Yildiz Technical University, Istanbul, Turkiye
1	Study of Photodegradation of Methylene Blue Dye Using Carbon Doped TiO2 Nanoparticles	Arun K Valvi (Rayat Shikshan Sanstha's Annasaheb Awate College Manchar)*; Gurumeet wadhava (Rayat Shikshan Sanstha's Veer Wajekar College)
2	Study of photo degradation of Methylene blue dye using Magnesium doped TiO2 nanoparticles	Arun K Valvi (Rayat Shikshan Sanstha's Annasaheb Awate College Manchar)*; Gurumeet Wadhava (Rayat Shikshan Sanstha's Veer Wajekar College, Phunde)
9	Improving the Stability of Clayey Soil by Utilizing Lime and Coir Fiber	Dharmendra Singh (Invertis University, Bareilly, Uttar Pradesh, India)*; Zeenat Bee (Invertis University, Bareilly, Uttar Pradesh, India); Pankaj Sharma (Chitkara University); Nishtha Srivastava (Invertis University, Bareilly, Uttar Pradesh, India); Rohit Pathak (Invertis University, Bareilly, Uttar Pradesh, India)
10	Analysis of Mechanically Stabilized Earthwall using Plaxis 2D	Dharmendra Singh (Invertis University, Bareilly, Uttar Pradesh, India)*; Vijay Kumar (MNNIT); Himanshu NA (MNNIT)
12	Enhancing Chili Crop Health: Multi-Class Disease Classification Using Deep Learning	Mamta Arora (Manav Rachna University)*; Arthi Potlapally (Manav Rachna University); Venu Jakkampudi (Manav Rachna University)

9 789334 117967

14	Adsorptive Removal of Diclofenac Using Biomass Derived Activated Carbon	Nilesh Mohan Khalse (Sir Visvesvaraya Institute of Technology, Nashik); Dipak Karbhari Chandre (SVIT, Nashik)*
15	Global Perspectives on Sustainability and Sustainable Development Research	Rishi Rana (Jaypee University of information technology wakhnaghat Solan Himachal Pradesh India)*
16	Annealing effects on Structure, Morphology, and Magnetism of Sol-Gel Synthesized CoFe2O4 for Renewable Energy Applications	Rohit Duglet (Himachal Pradesh University)*; Rohit Duglet (Department of Physics HPU Shimla)
17	The Evolution and Significance of Waste Management: Challenges and Opportunities for Sustainable Development	Jaiganesh Venu Dr.V.Jaiganesh (Bharath Institute of Higher Education and Research)*
18	Fuzzy DEMATEL Analysis of Major Obstacles in Green Recycling of PV waste	Dinesh Yadav (Delhi Skill and Entrepreneurship University)*; Sanjeev Kumar (Delhi Skill and Entrepreneurship University)
19	Review of Energy-Neutral Initiatives in Academic Institutions	Pushpa Gothwal (VIT Vellore)*; Yenesh Saxena (VIT); Mathan G (VIT University vellore)
20	Examination of reviews to establish a proposed model to overcome the challenges of Water Management system in India	Sunita Devi (HPU Shimla)*; Sukhvir Singh (Hp Regional Center Dharamshala)
21	Design and Analysis of 2-Bit Vedic Multiplier by Pass Transistor Logic	Dr. Anjali Sharma (University Institute of Technology, Himachal Pradesh University)*; Dr. Swati Singh (University Institute of Technology, Himachal Pradesh University)
22	Development of Fuzzy Model to Predict Performance of Single Slope Single Basin Solar Still	Deepa Akash Pandey (The Maharaja Sayajirao University of Baroda)*; Dr. Mayur Kevat (The Maharaja Sayajirao University of Baroda)
24	A Technical review on intelligent reflecting surface for multi-tier network in 6G communications	Yash Katyayan Mr. Mishra (National Institute Of Technology Delhi)*
25	Study Of Attenuation Profile Of Variable Thickness Metallic Absorber Plates With G-M Counter	Shambhavi Dr. Katyayan (G.L. Bajaj Group of Institutions Mathura)*

9 789334 117967

26	Synthesis, Characterization and Assessment of Antibacterial Properties of Copper Nanoparticles	Sirisha Deepthi Sornapudi (CCSC, PJTSAU)*
27	Mango Leaf Disease Segmentation and Feature Extraction using Machine Learning	Dr. Swati Singh (University Institute of Technology, Himachal Pradesh University)*; Dr. Anjali Sharma (University Institute of Technology, Himachal Pradesh University)
28	A Comparative Analysis of Graph Databases: An Overview	Aditi Badhan (Department of Computer Science Shimla)*
29	Potential of Braided Preform an Ingenious Reinforcementfor Structural Composites	Sasmita Kar (VSSUT, Burla, Odisha)*
31	Comparison of Fuzzy Logic and Fuzzy Analytical Hierarchy Process (FAHP) For Ranking of Renewable Energy Sources For Distributed Generation Systems	Neetu Dhiman (University Institute of Technology, Himachal Pradesh University, Shimla); Dumita . (Himachal Pradesh University Shimla)*; Dr. SANJAY Kumar Sharma (UIT HPU)
32	Convolutional Neural Network Architecture Based Detection of Dengue from Blood Smear Images	Dr. Swati Singh (University Institute of Technology, Himachal Pradesh University)*; Dr. Anjali Sharma (University Institute of Technology, Himachal Pradesh University)
33	Design and Analysis of PTL based Binary to Gray Code Converter on 65nm Technology	Dr. Anjali Sharma (University Institute of Technology, Himachal Pradesh University)*; Dr. Swati Singh (University Institute of Technology, Himachal Pradesh University)
34	Recent Advancement and Understanding the Mechanism of Scour in Bridges- A Review	Vanshika Bhardwaj (Punjab Engineering College)*
35	Modal Analysis of Functionally Graded Beam Integrating ANSYS Simulation and Fuzzy Inference System	Akankshya Priyadarshini (Department of Mechanical Engineering, Veer Surendra Sai University of Technology); Dr Mihir Kumar Sutar (Veer Surendra Sai University of Technology Burla)*; Sarojrani Pattanaik (Veer Surendra Sai University of Technology Burla, Odisha)
36	A Sustainable Stress-Strain analysis of Functionally Graded Beam with the results of Fuzzy Algorithm and ANSYS Simulation	Akankshya Priyadarshini (Department of Mechanical Engineering, Veer Surendra Sai University of Technology)*; Dr Mihir Kumar Sutar (Veer Surendra Sai University of

9 789334 117967

		Technology Burla); Sarojrani Pattnaik (Veer Surendra Sai University of Technology, Burla)
37	A Sustainable Design of Bike Ambulance with Side Car for Remote Areas	Dr Mihir Kumar Sutar (Veer Surendra Sai University of Technology Burla)*; Sarojrani Pattnaik (Veer Surendra Sai University of Technology Burla, Odisha)
38	Leveraging Machine Learning for Enhanced Renewable Energy Management and Optimization	Ajay Kumar (Himachal Pradesh University)*; Dr. Sanjay Kumar Sharma (UIT HPU); Dr. AJ Singh (Himachal Pradesh University)
39	Use of Geospatial Technologies for Precision Agriculture- A Review	Shubham Bhadoriya (Punjab Engineering College, Chandigarh)*
40	Metal-Organic Framework as Sustainable Solution for Water Remediation: A Review	Maridula Thakur (Himachal Pradesh University)*
41	Towards Environmental Sustainability: A Systematic Review of Green Chemistry Innovations	Maridula Thakur (Himachal Pradesh University)*
42	Key Research Areas in Landslide Studies in Indian Himalayas- A Review	Mehak Manzoor (Punjab Engineering College)*
43	Evaluation of removal efficiency of some heavy metals by low cost biosorbent: A Sustainable approach.	Ankita Kaura (Himachal Pradesh University)*
44	Investigation on an alternative Sustainable Disc Brake Material for better Braking	Dr. Sarojrani Pattnaik (Veer Surendra Sai University of Technology Burla)*; Dr Mihir Kumar Sutar (Veer Surendra Sai University of Technology Burla)
45	A Comparative Analysis for an Effective Disc Brake Material for a Sustainable Braking System	Dr. Sarojrani Pattnaik (Veer Surendra Sai University of Technology Burla)*; Dr Mihir Kumar Sutar (Veer Surendra Sai University of Technology Burla)
46	Si-Based High Energy Density Li-ion Batteries to Minimize Environmental Impacts	Ashish Kumar Mishra (Himachal Pradesh University)*; Balbir Singh Patial (Himachal Pradesh University)
47	AN OUTLINE OF THE SEVERAL FACETS OF ENVIRONMENTAL SUSTAINABILITY	Mayank Pratap (BHU)*
48	Analysis of glufosinate-ammonium sorption, desorption and leaching	Akhil Chaudhary (Himachal Pradesh University, Shimla)*

9 789334 117967

	potential in various organically altered soils	
49	Advancements in Li-ion Battery Technology and its Cathode Towards a Sustainable Future	Balbir Singh Patial (Department of Physics, Himachal Pradesh University Summerhill, Shimla-171005, H.P. INDIA)*; monika monika (Himachal Pradesh University)
50	Synthesis of Fe2O3 nanoparticles from Ferritin with tunable optical characteristics	Sunil Kumar (HPU Shimla)*; Manoj Kumar (HPU Shimla); Amarjeet Singh (HPU Shimla)
51	Analysis of glufosinate-ammonium sorption, desorption and leaching potential in various organically altered soils	Nisha Sharma (Himachal Pradesh University, Shimla)*; Akhil Chaudhary (Himachal Pradesh University, Shimla)
52	structural modifications and electrical properties of Sb doped InSe chalcogenide alloys	Diksha Thakur (Himachal Pradesh University Shimla)*; Vir Singh Rangra (Himachal Pradesh University Shimla)
53	Repurposing Athyrium filix-femina acetone extract as antimicrobial agent against bacterial pathogens	Neha neha (Himachal Pradesh University)*
54	Monitoring and analysis of Dimethoate insecticide in environmental samples	Srishti Shekhar (Himachal Pradesh University Shimla)*
56	Educational Strategies for Promoting Environmental Literacy: A Review of NEP 2020	Nitika Lakhanpal (HPU Shimla)*
58	Integrating Renewable Energy Solutions for a Sustainable Environment: Challenges and Opportunities	Vikas Sharma (Green Hills Engineering College)*; Dr. Anjali Sharma (University Institute of Technology, Himachal Pradesh University)
59	Quaternized P. ovata as a highly efficient adsorbent for selective adsorption of Congo red	Kriti . (Himachal Pradesh University, Shimla)*; Kiran Kumar (Himachal Pradesh University, Shimla)
60	SUSTAINABLE DEVELOPMENT POLICIES AROUND THE GLOBE: SOME REFLECTIONS	Dr. Kanika Handa (Department of Education, H. P. University, Shimla)*; Dr. Yudh Veer (Department of Education, H. P. University, Shimla)
61	A Systematic Review Examining Sustainable Development Policies and Practices Recommendations in India.	Ajay Kumar Attri (Department of Education, H. P. University, Shimla)*; Lalit Kumar Chauhan (Department of Education, H.P. University, Shimla)

9 789334 117967

62	Sustainable Pathways: Unveiling the Nexus of Environmental Concerns, Government Initiatives, and Generation Z's Adoption of Solar Technologies	Dr. Vikas Kumar (Guru Nanak Dev University, Amritsar)*; Amanpreet Kaur (Guru Nanak Dev University, Amritsar); Prabhjot Kaur (Guru Nanak Dev University, Amritsar)
65	Matrix Models in Population Dynamics: Exploring Structure and Applications	Aryaman Bahl (International Institute of Information Technology Hyderabad)*
66	Significance of Hybrid Manufacturing and its Technologies in the field of Manufacturing and Design Industry	Alina Khan (Jamia Millia Islamia); Abid Haleem (Jamia Millia Islamia); Aryaman Bahl (International Institute of Information Technology Hyderabad); Mohd Javaid (Jamia Millia Islamia); Shashi Bahl (I.K. Gujral Punjab Technical University)*
67	Exploring the Significant Advancements and Potential Applications of Additive Manufacturing in Industry	Yasir Khan (Jamia Millia Islamia); Asim Minhaj (Jamia Millia Islamia); Abid Haleem (Jamia Millia Islamia); Aryaman Bahl (International Institute of Information Technology Hyderabad); Mohd Javaid (Jamia Millia Islamia); Shashi Bahl (I.K. Gujral Punjab Technical University)*
68	A Comprehensive Review on Production of Biofuels	Alishba Aqlim (Meerut Institute of Engineering and Technology)*; Yash Sindhu (Meerut Institute of Engineering and Technology); Anshika . (Meerut Institute of Engineering and Technology); Mayank Chauhan (Meerut Institute of Engineering and Technology); Sandeep Sirohi (Hariom Saraswati P.G College, Haridwar, Uttarakhand); Surya Prakash D.V (Meerut Institute of Engineering and Technology)
69	Various Geotechnical Parameters Characterization of Clayey Soil using Pond Ash and Nylon Fiber	Dharmendra Singh (Invertis University, Bareilly, Uttar Pradesh, India)*; Vijay Kumar (MNNIT Allahabad, Prayagraj, India– 211004); Shashank Srivastava (MNNIT Allahabad, Prayagraj, India– 211004)
70	How do Income inequality, Poverty and population growth impact the environmental degradation in India: unveiling the reality	Rajveer Kaur Ritu (Akal University)*; Dr. Amanpreet Kaur (Guru Nanak Dev University)

9 789334 117967

71	Artificial Intelligence in Agriculture: A Comprehensive Review of Machine Learning and Deep Learning Applications	Kunwar Shaan (Bennett University)*; Nishant Singh (Bennett University)
76	A Review of the Optimization of Turning Parameters on Various Steel Grades	Swapnil Agarwal (G.B. Pant University of Agriculture & Technology, Pantnagar); Rajiv Suman (G.B. Pant University of Agriculture & Technology, Pantnagar); Shashi Bahl (I.K. Gujral Punjab Technical University)*; Mohd Javaid (Jamia Millia Islamia, New Delhi)
77	Sustainable Functional Coatings via Versatile Advanced Analytical Instruments (SEM, TEM, AFM, AAS, XPS, DMTA, TGA and DSC) for Energy and Environmental Applications	Kishlay Kant Singh (Shobhit University, Meerut)*; Divya Prakash (Shobhit Institute of Engineering & Technology, Meerut (NAAC 'A' Grade Accredited Deemed to-be-University)); Mansi Saini (Shobhit University, Meerut)
81	Machine Learning for Road Safety: Predicting Accidents through Data Analysis & Visualization Techniques	Jitendra Kumar Saini (Shobhit University Gangoh)*
82	Impact of pharmaceuticals on wastewater on treatment	Sneha Singh (Meerut Institute of Engineering and technology)*; shreya joshi (Meerut institute of engineering and technology); surya prakash (Meerut institute of engineering and technology)
83	Biomass Energy: A Comprehensive Review and Future Prospects	Khushboo Gupta (Meerut Institute of Engineering and Technology)*; ritika gupta (Meerut Institute of Engineering and Technology); aryan kaushik (Meerut Institute of Engineering and Technology); asmita rastogi (Meerut Institute of Engineering and Technology); surya prakash (Meerut Institute of Engineering and Technology)
85	Effect of Dysprosium on magnetic properties of Z-type Hexaferrite	Anjali Thakur (Ramjas College, University of Delhi)*
86	Simulation Study of SS-316 Powder Chisel Casting via Microwave Energy: A Multi-Physics Approach	Abhay Pal (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Divyansh Bhardwaj (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Himanshu Kumar Meena (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Vikas

9 789334 117967

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87	Multi-Physics Analysis of SS-316 Powder Spanner Casting Using Microwave Energy	Vikas Meena (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Abhay Pal (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Divyansh Bhardwaj (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Himanshu Kumar Meena (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Ashish Kumar (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Ashok Kumar Bagha (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Shashi Bahl (I.K. Gujral Punjab Technical University)*
88	Microwave Casting of an Aluminium Door Handle: A Multiphysics Simulation Approach	Ashish Kumar (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Divyansh Bhardwaj (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Abhay Pal (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Himanshu Kumar Meena (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Vikas Meena (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Ashok Kumar Bagha (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Shashi Bahl (I.K. Gujral Punjab Technical University)*
89	Multi-physics simulation study to microwave cast Allen key of stainless steel	Himanshu Kumar Meena (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Divyansh Bhardwaj (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Abhay Pal (Dr. B R Ambedkar National Institute of Technology, Jalandhar); Vikas

9 789334 117967

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90	Structural and Morphological Study of a Smart Material Potassium Sodium Bismuth Titanate (KNBT) for Environmental Sustainability	Saloni Bhardwaj (Ramjas College, University of Delhi)*
92	Inhibition of Mild Steel Corrosion using Synthesized Silver Nanoparticles	Jeetendra Bhawsar (Department of Chemistry, Atal Bihari Vajpayee Hindi Vishvidhyalaya, Mugaliya Kot, Bhopal, 462010, Madhya Pradesh, India)*
93	Influence of ZnO on Structural Properties of Environmental Friendly K0.5Na0.5NbO3 Piezoelectric Ceramics	Dr. Shammi Kumar (Department of Physics, Govt. College Nadaun, H.P.-177033, India)*
94	"Enhancing magnetic properties of M-type Ferrite with Aluminium-Neodymium doping for EV's PM Motors"	Deepika Sharma (Himachal Pradesh University)*
95	Integrating Sustainable Development Goals in the Education of Students with Disabilities	Mukesh Kumar (Himachal Pradesh University)*
96	Education for Sustainable Development and its Role in the Promotion of the Sustainable Development Goals	Kavita Aheer (Himachal Pradesh University)*
97	Structural, Optical and Cation Distribution of Ni(Co0.02Cu0.02Mn0.1Fe1.8)O4 Ferrite Synthesized by Metal-Organic Decomposition Method	Sachin Sharma (Himachal Pradesh University Shimla)*; N.S. Negi (Himachal Pradesh University Shimla)
99	Innovative Concrete Materials: Utilizing Crushed Bricks for Aggregate Replacement	Kaushal Kumar (Juit Waknaghat)*; Rishi Rana (Jaypee University of information technology)
100	Investigation of structural and electrical properties of Lead-free Potassium Bismuth Titanate piezoelectric ceramics	Vanni Bhardwaj (Himachal Pradesh University)*

9 789334 117967

101	Action of derivations on Lie ideals of Additively Inverse Semirings	Madhu Dadhwal (HPU)*
102	Solid-State Electrolytes and their Impact on the Future of Green Energy Technologies	Anjali (Himachal Pradesh University)*
103	"Sustainable Snow Cover Mapping in Himachal Pradesh: Integrating Machine Learning and Spectral Indices for Environmental Monitoring"	Vansheika Thakur (Nit Hamirpur)*; Chander Prakash (Nit Hamirpur)
104	A Review and Synthesis of 0.8 (Ba0.70Ca0.30TiO3)-0.2Bi (Mg0.5Ti0.5)O3 (BCT-BMT) Relaxor Ferroelectric Ceramics	Diksha Devi (Himachal Pradesh University)*; Nainjeet Singh Negi (Himachal Pradesh University)
105	Review on Improved Photocatalytic Performance of g-CN through Nonmetal Doping: Environment Remediation oriented sustainable approach	Navneet Verma (Himachal Pradesh University)*
106	Exploiting Statistical Information Value (SIV) approach for Landslide hazard zonation of a Western Himalayan region	Sahil Dhiman (NIT Hamirpur)*; Rajeshwar Banshtu (NIT Hamirpur); Chander Prakash (NIT Hamirpur); Laxmi Versain (Degree College Dharamshala, Himachal Pradesh)
107	A Review on Na0.5Bi0.5TiO3 (NBT) and (1-x) NBT-xSrTiO3 (NBT-ST) Relaxor Ferroelectric Ceramics	Purnima Raghav (Himachal Pradesh University)*; Nainjeet Singh Negi (Himachal Pradesh University)
108	Optimized Multi-Component Attention Graph Convolutional Neural Network with FAResNet for Cardiovascular Disease Prediction in Rheumatoid Arthritis Patients	Sunil Kumar (University Institute of Technology, H.P.University, Shimla-5)*; Amarjeet Singh (Department of Computer Science, Himachal Pradesh University, Summerhill, Shimla); Rajesh Chauhan (University Institute of Technology, H.P.University, Summerhill, Shimla); Kapil Bhatt (University Institute of Technology, Himachal Pradesh University, Summerhill, Shimla)
109	Guar gum based quaternized adsorbent for the effective removal of anionic dyes	Kavita Chauhan (HPU Shimla)*
112	Pine needles modified with thiosemicarbazide for the removal of	Babita Kumari (Department of chemistry, HPU)*

9 789334 117967

	harmful metal ion and cationic dye from wastewater	
113	"Recent glacier area changes in the Ravi Basin: A study on the drivers and consequences of glacial retreat."	Shanta Kumar (Central University of Himachal Pradesh)*; Anurag Linda (Central University of Himachal Pradesh)
114	Photocatalytic valorization of cellulose using DES -TiO2 complex based nano-catalyst	Prasenjit Chakraborty (The University of Burdwan)*
115	Environmental survey of a cinchona plantation village situated in the Eastern Himalayas, India: Sustainable development perspectives	Sayan Bhattacharya (School of Ecology and Environment Studies, Nalanda University, India)*; Avishek Talukdar (University of Calcutta, India)
116	"Leveraging Influencer Marketing For New Age Employment: Opportunities In the Digital Era"	kanak singhal (Shobhit university)*; Shubhangi Sharma (Shobhit university); Janvi Chauhan (Shobhit university)
118	Spirulina for Potential Healthcare Applications	Roshan Singh (Shobhit Institute of Engineering & Technology)*; Rahul Das (Shobhit Institute of Engineering & Technology,Meerut); Vikrant Gaur (Shobhit Institute of Engineering & Technology,Meerut); Subrata Das (Shobhit Institute of Engineering & Technology,Meerut); Sandeep Kumar (Shobhit Institute of Engineering & Technology,Meerut)
119	Nanomaterials-Enhanced Herbal Medicine: A Novel Approach for Improved Therapeutic Diagnosis and Efficacy	Anshita Singh (Shobhit institute of engineering and technology, Meerut)*; Gaurav Agrawal (Shobhit institute of engineering and technology, meerut); Sahdev Singh (Shobhit institute of engineering and technology, Meerut); Lomas Tomar (Shobhit institute of engineering and technology, Meerut)
120	Greening Healthcare: Sustainable Materials for Environmental	Gaurav Agrawal (Shobhit institute of engineering and technology, meerut)*; Siddhi Jindal (Shobhit institute of engineering and technology, Meerut); Lomas Tomar (Shobhit institute of engineering and technology, Meerut); Aryan Sharma (Shobhit institute of engineering and technology, Meerut)

9 789334 117967

121	Revolutionizing Agriculture: The Impact of Machine Learning and Deep Learning	Mudit Singh (Shobhit Institute of Engineering & Technology)*; Adrika Aditya (Shobhit Institute of Engineering & Technology); Adarsh Mishra (Shobhit Institute of Engineering & Technology); Navneet Sheokand (Shobhit Institute of Engineering & Technology); Anuj Kumar Pandit (Shobhit Institute of Engineering & Technology); Barkha Singh (Pt. Jwala Prasad Upadhayay Govt. College)
122	Assessing the Ecological Effects of Hydropower Dams on Diatom Communities in the Sutlej River	Arvind Kumar Negi (Department of Environmental Studies)*
123	From Synthesis to Application: The Role of Nanomaterials, Soft Materials, and Biomaterials in Medical Health Care	Kashvi Goel (Shobhit institute of engineering and technology,Meerut)*; Gaurav Agrawal (Shobhit institute of engineering and technology, meerut); Sweety Pal (Shobhit institute of engineering and technology, Meerut); Lomas Tomar (Shobhit institute of engineering and technology, Meerut)
124	Sustainable Heavy Metal Remediation in Water Using Green-Synthesized Moringa and Coriander Nanoparticles	Kashvi Dixit (Shobhit University)*; Divya Prakash (Shobhit Institute of Engineering & Technology, Meerut (NAAC 'A' Grade Accredited Deemed to-be-University))
125	A Review of Recent Advances in Sustainable Environmental Practices for Road Junction Design and Management	Pawan Chauhan, Pardeep Kumar Gupta Department of Civil Engineering, Punjab Engineering College, Chandigarh
126	Phytoremediation Strategies: A Pathway to Soil Decontamination and Environmental Health	Gopal Singh (ABVGIET)*; Disha Thakur (University Institute of Technology (UIT), HPU Shimla)
127	Sustainability Assessment of Sewage Treatment Plants in Northern India	Rana Pratap Singh (Government Engineering College Gopalganj Bihar)*
128	Advanced Applications of Soft Biomaterials in Clinical Biomedical Engineering	Saumya Sinha (Shobhit Institute of Engineering and Technology, Meerut)*
132	Evaluation of Aspergillus fumigatus for degradation of Resorcinol	Shalini Singh (Shri Ramswaroop Memorial University, Uttar Pradesh,.)*
133	Diabetic Foot Ulcer: Current Scenario and Future Strategies	Keshav Kumar (Shobhit Institute of Engineering & Technology, Meerut, Uttar

9 789334 117967

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135	Experimental Investigation of Machining Performance of Micro Groove Textured High Speed Steel Tools During Turning of Ss 316 L Under Dry Environment Conditions	Balasubramanyam N (S.V.University College of Engineering Tirupati)*
137	Harnessing The Potential of Thermoelectric for Daily life.	Abhishek Verma (Hpu)*
138	Optimization Of Fused Deposition Modelling Process Parameters By Using A Grey Fuzzy Logic Technique	Balasubramanyam N (S.V.University College of Engineering Tirupati)*

9 789334 117967

Abstracts

A01 Brief Review of Drilling of Carbon Fibre/Reinforced Polyetheretherketone (CF/PEEK) Composites

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Carbon Fibre/Reinforced PolyEtherEtherKetone (CF/PEEK) thermoplastic composite materials are employed by aerospace, automotive, defense industry, medical and sports equipment industries because of their high strength-to-weight ratios and exceptional chemical resistance. These materials require various machining processes fr assembly operations, although they are often produced close to their final shape. Drilling is one of the widely used machining operations when these materials are assembled. However, drilling these materials presents significant challenges due to their heterogeneous structures. Cutter tool geometry and machining parameters are pivotal in determining the surface quality and integrity of drilled holes. Numerous studies have been conducted on the drilling of CF/PEEK composites.
This study presents an up-to-date and concise review of the parameters affecting the drilling behavior of CF/PEEK thermoplastic composites and aims to enhance the understanding of their drilling behavior.

A02 Examination of Punch Tip Wear Angle on Sheet Metal Cutting Process

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Sheet metal cutting process with presses is widely used for mass production in automotive, electronics, computer, textile, food, defense, aircraft industries as well as manufacturing industry. After the blanking process, it usually goes through many processes such as sheet metal bending, spinning, embossing, drawing, piercing, cutting off, shaving, trimming etc. In this study, a cutting die was designed and produced for cutting a rectangular soft metal sheet with sharp corners. The cutting surface of the cut piece, how the fracture surface (Zf), rolling (Zr), cutting surface (Zs), burr height (Zb) change according to the punch surface roughness was investigated. The cutting surface roughness of the cut piece changes according to the clearance amount between the die and the punch was investigated. The effect of the increase in the amount of burr with the number of cuts on the die-punch surface roughness was examined.

9 789334 117967

A03 Sustainability through Process Improvements in Photochemical Machining

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Sustainability is a “hot topic” today’s manufacturing world and companies are looking for solutions to eliminate/minimize wastes through all processes. Photochemical machining which one of main nontraditional machining methods, has various steps to finalize part manufacturing. The process is extensively used in precise part productions, especially printed circuit boards. PCM heavily employs various chemical from starting step of cleaning part to final step, therefore process requires detail examination to be a sustainable process. In this study, PCM will be extensively searched and process improvements will be discussed in detail. The existence process steps will be reconsidered to obtain sustainability. It is aimed to maintain process improvements by eliminating/minimizing environmentally hazardous solutions, hence leading to sustainable PCM process.

1 Study of Photo degradation of Methylene Blue Dye Using Carbon Doped TiO2 Nanoparticles

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Pure and Carbon doped TiO_2 nanoparticles at various concentrations were fabricated by using conventional sol gel technique. Titanium butoxide and glucose is used as a precursor for Titanium dioxide and carbon respectively. The samples were calcinated at 500˚C. Morphological and elemental analysis of the samples is done by using a scanning electron microscope (SEM), energy dispersive X-ray spectroscopy (EDAX), X-ray diffraction, micro-raman spectroscopy. UV-Vis diffuse reflectance spectra are used for optical characterization. Carbon-doped TiO_2 samples demonstrated photocatalytic activity with a lower band gap (2.93eV) than undoped TiO_2 (3.12eV). As a consequence, it was discovered that C-doped TiO_2 nanoparticles had greater photocatalytic activity than undoped TiO_2.

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2 Study of photo degradation of Methylene blue dye using Magnesium doped TiO2 nanoparticles

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Pure and Mg-doped TiO2 nanoparticles for different dopant concentrations were synthesized by sol gel method. The samples were characterized for morphological and elemental analysis using Scanning Electron Microscope (SEM), and Energy Dispersive X-ray Spectroscopy (EDX), X-ray diffraction and Micro-raman spectroscopy Optical properties by UV-Vis diffuse reflectance spectra. The Photocatalytic activity of the samples for Methylene blue dye using Mg-doped TiO2 showed narrower band gap (2.84 eV) than undoped TiO2 (3.12 eV). As a result, it was observed that the photocatalytic activity of Mg-doped TiO2 nanoparticles was higher than that of undoped TiO2.

9 Improving the Stability of Clayey Soil by Utilizing Lime and Coir Fiber

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The construction of roads on clayey soils (CS) presents challenges due to soil volume alterations and lower bearing capacity when contrasted with stabilized soils. The primary objective of this research is to examine the stability of CS through the utilization of Lime and Coir Fiber (CF). This study presents an analysis of diverse engineering properties of CS with different ratios of Lime and CF in the CS. The Lime and CF were blended by replacing soil by weight at percentages of 1.5, 3.0, 4.5 and 6.0%, and 0.5, 1.0, 1.5 and 2.0%, respectively. Hence, to evaluate the efficacy of treating the CS, geotechnical tests like Expansion Ratio (ER), California Bearing Ratio (CBR), Unconfined Compressive Strength (UCS), Compaction, Free Swell Index (FSI), Liquid Limit (LL) and Plastic Limit (PL) have conducted according to IS: 2720. The ER and FSI values of CS consistently decreased with the addition of Lime and CF. Meanwhile, the CBR and UCS values of CS showed improvement when treated with Lime and CF. This enhancement proves beneficial for the highway's subgrade. Additionally, this study conducts microstructural analysis using Field Emission Scanning Electron Microscopy (FESEM) and X-Ray Fluorescence (XRF) analysis. The formation of Calcium Silicate Hydrate (CSH) and Calcium Aluminate Hydrate (CAH) occurs as a result of incorporating lime into the CS. On the whole, the findings suggest

9 789334 117967

that the treatment led to a denser soil structure, particularly in the filling of larger pores as compared to the untreated soil.

10 Analysis of Mechanically Stabilized Earthwall using Plaxis 2D

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In recent years, there has been a major construction of reinforced earth walls or mechanically stabilized earth (MSE) walls, majorly in transport sector (in railways and highways). Many construction like construction of embankments, soil fill in fly overs etc. make use of reinforced earth because of safety, economy and environmental factors as compared to conventional retaining walls. Wall deformations are especially important to fulfill the serviceability criteria of MSE wall. This study was performed to analyses the wall deformations for various length of Geogrid reinforcement in the soil. According to some standard codal provisions the minimum length of reinforcement required should be at least 70 percent of the height (0.7H) of MSE wall. However it is not always possible to have enough space to lay down these required reinforcement length due to existing ground conditions. This study was performed to analyses the effect of Geogrid reinforcement length on the wall deformations for varying parameters. The parameters that were considered in this study are wall height of 10 m, static loading of 15 kN/m2, friction angle of reinforced soil, unit weight of reinforced soil, and vertical spacing between the Geogrid reinforcement layers. The modelling and analysis of this study was done on PLAXIS 2D, a finite element method. This study is to find the possibility of having shorter reinforcement than the specified length of the reinforcement given by standard codal provisions laid by agencies around the world by changing various parameters like backfill soil unit weight, friction angle, vertical spacing between reinforcements etc. The results were collected and analyses through various graphs between wall deformations and other parameters. The MSE wall had maximum stability with FOS of 1.816 when the ⊚ = 42° with ⊚ = 16 kN/m3 at vertical spacing of 0.2 m.

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12 Enhancing Chili Crop Health: Multi-Class Disease Classification Using Deep Learning

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Chili leaf diseases pose significant threats to crop yield and quality in agricultural fields. Early and accurate detection of these diseases is crucial for effective crop management and ensuring sustainable agricultural practices. The primary objective of this study is to develop an accurate and efficient system for detecting various chili leaf diseases using advanced machine learning techniques, specifically transfer learning and convolutional neural networks (CNN). Additionally, the study aims to implement this system as a web application to provide real-time disease identification support to farmers in the field. The dataset comprised photos of chili leaves taken from actual fields in Andhra Pradesh and Telangana, representing various diseases such as leaf curl virus, yellowish spots, leaf spots, cabai virus, chili whitefly, and bacterial spots. The photos underwent preprocessing steps including scaling and standardization. Transfer learning techniques were applied using pre-trained models to enhance the accuracy of the CNN in identifying the diseases. The trained model achieved an accuracy exceeding 95% in identifying different chili leaf diseases on the validation set. This high level of accuracy underscores the effectiveness of combining transfer learning with CNN for disease detection. The developed system, implemented as a web application, provides farmers with a valuable tool for the real-time identification of chili leaf diseases. This application facilitates better crop management and has the potential to significantly improve yield by enabling timely and precise interventions.

14 Adsorptive Removal of Diclofenac Using Biomass Derived Activated Carbon

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A one-step chemically activated thermal carbonization method was employed to synthesize activated carbons using sugarcane waste and rice straws as biomass waste. The synthesized activated carbons were then used to remove the highly toxic pharmaceutical pollutant diclofenac from synthetic wastewater. The physiochemical characteristics of synthesized activated carbon was studied using different characterization techniques such as EDX, XRD, FESEM, XPS, Surface area and pore size distribution. The activated carbons exhibited well-developed porous structures, resulting from potassium hydroxide pre-treatment of the biomass. Both synthesized carbons showed a variety of

9 789334 117967

oxygen functional groups on their carbon skeletons, making the activated carbons highly efficient adsorbents. Diclofenac adsorption experiments were conducted to optimize various experimental parameters, such as adsorbent dosage, adsorption temperature, adsorbate concentration in synthetic wastewater, and adsorption time. The results showed that the highest adsorption capacity was achieved by rice straw-derived activated carbon (105.3 mg/g) compared to that derived from sugarcane waste (80.4 mg/g). The experimental data fitted well to the pseudo-second-order kinetics model and the Langmuir adsorption isotherm, suggesting monolayer adsorption of diclofenac on the activated carbon. Thermodynamic studies indicated that the adsorption of diclofenac on activated carbon was chemisorptive in nature and highly endothermic. Adsorption of diclofenac in real wastewater samples, along with reusability tests, was also performed with the synthesized activated carbons.

15 Global Perspectives on Sustainability and Sustainable Development Research

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This paper explores the evolving landscape of sustainability and sustainable development research from a global perspective. As the world grapples with unprecedented environmental, social, and economic challenges, the need for a comprehensive understanding of sustainability practices has never been more urgent. This study provides a critical review of current research trends, methodologies, and key findings in the field of sustainability, highlighting regional differences and commonalities across various global contexts. Through an analysis of literature from diverse geographical regions, this paper identifies the central themes driving sustainable development discourse, such as climate change mitigation, renewable energy adoption, sustainable urban planning, and social equity. It also ex-amines the role of policy frameworks, technological innovations, and community engagement in promoting sustainability across different cultural and economic settings. By synthesizing these insights, the paper aims to provide a holistic view of the state of sustainability research worldwide, offering recommendations for future studies that can bridge existing knowledge gaps and contribute to more effective, globally coordinated sustainability efforts. This research underscores the importance of an interdisciplinary approach in ad-dressing the complex, interrelated challenges of sustainable development and calls for enhanced collaboration among researchers, policymakers, and practitioners to foster a more sustainable future.

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16 Annealing effects on Structure, Morphology, and Magnetism of Sol-Gel Synthesized CoFe2O4 for Renewable Energy Applications

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The synthesis of magnetic nano-sized spinel ferrites, like CoFe2O4, has gained attention for its applications in renewable energy and environmental technologies. This study focuses on optimizing the magnetic properties of single-phased nano-crystalline CoFe2O4 ferrite prepared via the sol-gel auto-combustion technique. We investigated the effect of thermal annealing at 500 °C, 700 °C, and 900 °C for 5 hours on the ferrite's structure and properties. Characterization using XRD, FE-SEM, EDS, and VSM revealed crystallization in the Fd3m space group, with average crystallite sizes between 30 and 34 nm. FE-SEM images showed uniform morphology and spherical nanoparticles with increasing grain size at higher annealing temperatures. EDS confirmed the stoichiometric balance of Co and Fe ions. High temperature annealing significantly impacted the magnetic properties, enhancing saturation magnetization and magnetocrystalline anisotropy while reducing coercivity. These modifications are crucial for improving the performance of magnetic materials in applications like magnetic refrigeration, electromagnetic energy harvesting, and environmental remediation. The observed ferromagnetism and temperature-dependent magnetic behavior highlight the potential of CoFe2O4 nanoparticles in advancing sustainable energy solutions. Thus, tailoring magnetic parameters through annealing can contribute to developing more efficient and eco-friendly materials.

17 The Evolution and Significance of Waste Management: Challenges and Opportunities for Sustainable Development

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Waste management has emerged as a critical component of urban planning and environmental management across the globe. As urbanization continues to increase and population densities rise, the challenges of managing waste effectively have become more pronounced. This paper explores the evolution of waste management practices, the current challenges faced by municipalities, innovative solutions that have emerged in the sector, and the role of technology and policy in enhancing waste management systems. Through case studies and analysis, this paper underscores the importance of sustainable waste management in mitigating environmental impacts and promoting public health.

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18 Fuzzy DEMATEL Analysis of Major Obstacles in Green Recycling of PV waste

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In this analysis Fuzzy DEMATEL method was employed to analyze major obstacles in the green recycling of PV waste. This method enables the examination and identification of the intricate causal relationships between the various barriers to efficient recycling. Key obstacles identified include Lack of Standardized Recycling Processes, Technological Challenges, Economic Viability, End-of-Life Collection and Logistics and Environmental Impact. To create a direct-relation matrix, expert opinions were compiled and converted into fuzzy numbers. The matrix was then defuzzied and normalized. The end result is a total-relation matrix that clearly illustrates the interdependencies between each obstacle by emphasizing its prominence and net cause. The results provide insightful information for industry stakeholders and governments that want to improve the sustainability and efficiency of PV waste recycling processes.

19 Review of Energy-Neutral Initiatives in Academic Institutions

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Energy neutral buildings (ENBs) are a significant innovation in sustainable architecture, designed to lower carbon emissions by aligning energy usage with renewable energy production. This paper provides an empirical analysis of ENBs using a hybrid methodology. This methodology integrates diverse renewable energy sources, including solar, wind, electrodynamometers, and piezoelectric transducers (PZTs). The study also underscores the value of combining hybrid renewable energy resources with traditional options like solar panels. The proposed methodology proves particularly effective in situations where conventional renewable resources are scarce.

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20 Examination of reviews to establish a proposed model to overcome the challenges of Water Management system in India

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India's water usage has significantly risen in recent decades due to several socioeconomic variables and demographic changes. To satisfy the demand, supplies have significantly risen as a result of extracting surface and groundwater. Consequently, numerous dry and semiarid areas over exploit their underground water resources, leading to a decline in water levels and a degradation in the quality of groundwater, ultimately culminating in a shortage of groundwater. Surface water resources are frequently depleted in numerous basins due to excessive usage. Surface reservoirs are depleting quickly due to siltation. The increasing menace to freshwater supplies is being caused by the waste generated by urbanization and industrial effluents. India's per capita freshwater availability has declined from 6008 M3 per year in 1947 to approximately 2200 M3 per year since 2000, and further to 1486 M3 in 2021. The projected decrease is expected to reach 1170 cubic meters by 2050, according to the CWC [2015]. The issue has progressively and considerably evolved. Water scarcity poses a basic challenge in terms of feeding the growing global population, protecting ecosystems, and maintaining social stability and health. Society and the environment face potential hazards due to escalating conflicts and disagreements. This study examines the management challenges, growing issues, and water problems in India. Ultimately, a proposed framework is constructed after using specific measures to tackle the challenges.

21 Design and Analysis of 2-Bit Vedic Multiplier by Pass Transistor Logic

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To achieve area and power efficiency in digital circuits, many digital designing techniques have been presented by PTL (Pass Transistor Logic) family. In pass transistor logic, only N- Channel MOS transistors are used for circuit designing. This results in area and power efficient digital circuits for low power electronics. Vedic mathematics was used in ancient time for various mathematic calculations. In this work, design and analysis of 2-Bit Vedic Multiplier by Pass Transistor Logic has been presented on 65nm technology. Multiplier circuit consists of 26 NMOS and 10 PMOS transistors where all PMOS transistors are used in implementation of CMOS NOT gate required for obtaining complement of inputs.

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Surface area consume by the 2-Bit Vedic Multiplier is 416.6μm2. Variation in power dissipation with respect to applied voltage is also presented in this work using Microwind designing tool. The results show that at 0.7V, PTL premised 2-Bit Vedic Multiplier emulates power dissipation of 30.131μW. For future work, circuit presented in this work can be further modified and emulated to obtain 4-bit Vedic multiplication.

22 Development of Fuzzy Model to Predict Performance of Single Slope Single Basin Solar Still

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Clean and potable water is a very important resource for human life. This resource has become scarce with a large proportion of global population facing shortage of availability of clean water. Use of solar energy for distillation of brackish/dirty water to obtain distilled water has become very popular in areas having abundant sunlight. The distilled water yield and efficiency of solar stills is dependent on variety of factors like the size and design of solar still, solar insolation and depth of water in the solar still absorber basin. The single slope single basin type of solar still is selected for the work as it is basic type of solar still which can be used as basis for comparison of output and performance of all types of solar stills and their enhancements. In this paper development of fuzzy logic based predictive model is described to predict the performance of single slope single basin type of solar still. Experiments are conducted using this type of solar still and the result shows a good match between experimental parameter and fuzzy model.

24 A Technical review on intelligent reflecting surface for multi-tier network in 6G communications

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Intelligent reflecting surface (IRS) is an energy and cost-efficient enhancement technology that can improve the electromagnetic property of the reflected signal by the programmable meta surface based unit cells. Nowadays research is ongoing to adopt IRS in multi-tier network targeting to boost the performance of forthcoming advanced networks. Moreover, user association is a crucial research issue

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for multi-tier networks. The work, therefore, analysed the downlink signal propagation characteristics, i.e., path loss and received power performance and user association considering both the conventional and IRS-assisted multi-tier networks. It is considered promising given the recent attention paid to the IRS concept for 6G wireless communication technology, we propose a survey on IRS in this article, and the following applies to IRS-supported communications. Summary includes capacity/data rate analysis, power/spectrum analysis Optimization, channel estimation, deep learning-based design, and reliability analysis. We then review the implementation of the IRS and using IRS for secure communications, endpoint location, and other novel applications. We continue to identify ourselves future research directions for the IRS, and the vision of the IRS technologies that play a key role in 6G communication networks.

25 Study of Attenuation Profile of Variable Thickness Metallic Absorber Plates With G-M Counter

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The paper investigates the behaviour of gamma radiation as it interacts with different materials through a transmission experiment using a Geiger Muller counter. In this experiment, energetic gamma rays are directed towards a detector after passing through metallic absorber plates of varying thickness. The primary objective is to analyze how the intensity of radiation changes as it passes through different thicknesses of the absorber plates. During the experiment, radiation counts per 30 seconds are meticulously recorded and plotted. These plots are crucial as they allow researchers to determine the half value layer (HVL) of the materials. The HVL represents the thickness of the material required to reduce the intensity of the gamma radiation by half. From the graphical analysis of the radiation counts, researchers are able to calculate two important parameters: the linear attenuation coefficient and the mass attenuation coefficient. These coefficients quantify how effectively a material attenuates or reduces the intensity of gamma radiation. Moreover, the paper explores the relationship between these attenuation coefficients and the density of the materials used as absorbers. Through a comparative study, it is observed that the attenuation coefficients are directly proportional to the density of the absorbing materials. This finding is significant as it underscores the importance of material density in designing effective radiation shielding and monitoring systems. Overall, the paper contributes valuable insights into radiation detection, shielding, and monitoring applications. By systematically analyzing the attenuation of gamma radiation through different materials, it provides essential data for improving safety protocols in environments where radiation exposure is a concern.

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26 Synthesis, Characterization and Assessment of Antibacterial Properties of Copper Nanoparticles

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Nanoparticles are advanced materials having a variety of functional properties that can be synthesized either through a top-down or a bottom-up approach, which produces toxic by-products. Adoption of safe, harmless, cost effective and environment friendly methods are required for nanoparticle preparation. Plants parts viz, stems, flowers, leaves and seeds can be used as reducing agents in synthesis at milder temperature, pH, and pressure and at low cost, thus eliminating the harmful traits. Use of a combination of reducing agents from plant and animal origins is limited. The present paper describes copper nanoparticle synthesis using a combination of bio-reducing agents namely methanolic plant leaf extracts and sericin extracted from mulberry cocoons. The plant extracts have the dual function of capping and reducing agents in nanoparticle synthesis. A dispersing agent, PVP has been used to control the size and shape of the nanoparticles. Fresh leaves of Psidium guajava, Moringa oleifera, Annona squamosa, Vitex nigundo, Citrus limon were used for the methanolic extraction of leaves; while Bombyx mori silkworm cocoons were used for sericin extraction. Copper nanoparticles were synthesized through polyol synthesis method, using the five methanolic leaf extracts, and sericin as the reducing agent in 2:1 proportion, with copper salt (cupric nitrate trihydrate), PVP and cupric chloride. CuNP synthesized using lemon and sericin reducing agents showed rod-shaped structure, while other four copper nanoparticles showed flower-shaped morphology in FeSEM. EDX showed copper in terms of mass expressed as weight percentage, the order of which is CAS2.1 > VS2.1 > MS2.1> GS2.1>LS2.1. MIC and antibacterial assay of nanoparticles indicated antibacterial activity at a minimum concentration of 2.5mg/mL for all the CuNP's except GS2.1 for Staphylococcus aureus; while 1.25mg/mL of CuNP showed appreciable antibacterial activity for Escherichia coli for all CuNP's except VS2.1.

27 Mango Leaf Disease Segmentation and Feature Extraction using Machine Learning

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Detecting fruit diseases is a crucial advancement for food safety and sustainable agriculture. However, manual analysis requires considerable effort and time. Identifying diseases in fruits early enhances crop quality and minimizes production losses. This study introduces a method that combines image

9 789334 117967

processing with machine learning to identify diseases from mango leaf images. Specifically, the machine learning algorithm segments powdery mildew on mango leaves. First, the diseased leaf images are processed with a Gaussian filter, and then the Region of Interest (ROI) is identified using the K-means clustering algorithm.

28 A Comparative Analysis of Graph Databases: An Overview

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In the contemporary epoch characterized by advancements in information technology, computational systems are ubiquitous, leading to a perpetual stream of data emanating from diverse origins including social media platforms, mobile devices, machine-generated outputs, and websites. This colossal magnitude of data, commonly denoted as "Big Data," exceeds the processing capabilities of traditional tools. The essence of Big Data resides in its analytical methodologies, which endeavor to extract the most pertinent and valuable insights. The term NOSQL has gained significant traction within the Information Technology sector. NOSQL databases are systematically classified into categories such as Key-Value, Column-family, Document-Oriented, and Graph databases. In contrast to conventional relational database systems, Graph databases demonstrate superior performance in managing relationships and interconnections among data points, rendering them particularly advantageous for applications that pertain to social networks, recommendation systems, and fraud detection. In this scholarly article, we concentrate on graph databases, which are fundamentally anchored in the principles outlined by Graph theory. This article offers a comparative analysis of various graph databases. Moreover, the integration of machine learning techniques within the framework of graph databases is succinctly explored. This technological paradigm is utilized for the storage of data characterized by a high degree of connectivity. The technological framework of graph databases encompasses several technical attributes that are inherent to traditional databases, such as ACID compliance and availability [20]. Our aim is to establish a foundational basis for the selection of the most appropriate graph database by assessing them according to criteria including model, application, and transaction capabilities.

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29 Potential of Braided Preform an Ingenious Reinforcementfor Structural Composites

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Braiding is a propitious textile preform currently appreciated for real-time applications. The reinforcement of fibers in their braided, woven, or knit form highly influences the structural strength. Braided composites highly improve the composite strength by reducing catastrophic failure and enhancing structural safety. These are mostly recommended for the components used in aerospace engineering, automobile, sports, and military applications. Braided fabric reinforcement exhibits excellent structural stability and damage resistance due to the unique geometrical interlacing of yarns. It outlines the types of braiding and their advantages and disadvantages in various fields of application. It also highlights various damage failures in 2D and 3D braided composites and development in mechanical performance. This review develops a platform to promote future research.

31 Comparison of Fuzzy Logic and Fuzzy Analytical Hierarchy Process (FAHP) For Ranking of Renewable Energy Sources for Distributed Generation Systems

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In today's world, non-renewable energy sources are being depleted to a greater extent. In this context, there has been growing interest in utilizing renewable energy sources over the past few years and the main concern is determining which renewable energy source is most suitable for distributed generation (DG) systems. The renewable energy sources used in DG systems are wind generators, fuel cells, micro turbines and photovoltaic cells. In this manuscript, a multicriteria decision making (MCDM) is developed to find which energy source is better choice for use in DG systems. For this, a case study is examined from the literature, where several parameters are investigated and final ranking of alternatives is determined using fuzzy analytical hierarchy process (FAHP) and fuzzy logic. Finally, a comparison of the rankings of renewable energy sources by fuzzy logic and FAHP is presented.

9 789334 117967

32 Convolutional Neural Network Architecture Based Detection of Dengue from Blood Smear Images

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This study aims to develop a computerized system for diagnosing dengue using Convolutional Neural Network (CNN) models, aligning with sustainable development goals related to health and well-being. Drawing inspiration from recent research on CNNs' capabilities in medical image analysis, our CNN design effectively classified dengue images into two distinct categories. This achievement significantly advances affordable and accessible healthcare solutions. The model was rigorously trained over 15 epochs with a dataset of 39,500 images, resulting in an impressive accuracy rate of 93%. These findings are impactful for global health, showcasing the CNN model's proficiency in analyzing complex patterns. This capability could enhance the timely diagnosis and management of medical conditions, contributing to poverty alleviation and the reduction of inequalities.

33 Design and Analysis of PTL based Binary to Gray Code Converter on 65nm Technology

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A binary to Gray code converter is used in digital electronics to reduce processing errors during data transmission. Different power efficient techniques have been presented in literature which can be used to achieve efficient digital design. In this paper an area and power efficient 18T pass transistor logic (PTL) based binary to gray code converter design has been presented on 65nm technology. The proposed converter design consists of 12 NMOS and 8 PMOS transistors. Three PTL based XOR modules have been used to design this binary to gray code converter. The layout size in terms of height, width and surface area has been presented in this work. Also power consumption has been measured at various input supply voltages i.e. 0.5V, 0.7V and 0.9V respectively. The PTL based design consumes less area and power as compared to CMOS design. This binary to gray converter circuit has been designed and simulated using Microwind 3.1 designing tool. Results show that area consumed by the proposed circuit is 153.7 μm2 on 65nm technology. At 0.7V input supply voltage the proposed design consumes 17.014μW power.

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34 Recent Advancement and Understanding the Mechanism of Scour in Bridges - A Review

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Scouring in bridges is a leading cause of failure in bridges worldwide possessing significant challenges to the sustainability and safety of infrastructure. Understanding the mechanism of scour is essential for developing effective and sustainable mitigation strategies. The mechanism of scour is dependent on complex relationship between hydrodynamic factors, mechanism of sediment transport, and hydrological parameters. When water flows around bridge piers or abutments, it generates vortexes that increase the shear stress on the riverbed, leading to the scouring of bridge. The depth and extent of scour are influenced by factors such as flow velocity, sediment size, and the shape and size of the bridge piers/abutments. In this review study the mechanism of scour is studied whilst also focusing on the recent advancements for sustainable mitigation methods. This study reviews how recent research has enhanced the understanding of scour mechanisms through advanced computational fluid dynamics (CFD) models, laboratory experiments, and field observations. In addition to understanding scour mechanisms, the study highlights sustainable mitigation strategies that combine eco-friendly materials and vegetative solutions with traditional engineering approaches. There is a need of further research of understanding the mechanism of scour to improve resilience of bridge structures against scour.

35 Modal Analysis of Functionally Graded Beam Integrating ANSYS Simulation and Fuzzy Inference System

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This paper represents a comprehensive frequency analysis of functionally graded beam. FG beams, are well known as an advanced composite material, characterized by their composition specific gradation. This paper focuses on the modal analysis of FG beam graded axially by changing the gradient index of material property in the one parameter power law function. The entire analysis is done for a clamped-clamped end condition. The evaluated frequencies values for different length to thickness ratio are compared with the results of fuzzy inference system. A lower differential error of 9.89 % is resulted at

9 789334 117967

lower slenderness ratio that increases with increase in the ratio. These results justify that the solution method adopted for the analysis is in good agreement with the algorithmic evaluation of Fuzzy analysis.

36 A Sustainable Stress-Strain analysis of Functionally Graded Beam with the results of Fuzzy Algorithm and ANSYS Simulation

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Composites, play a major role in material sciences to design and manufacture lightweight structures. This paper presents the integration of nano-structure-enhanced epoxy in functionally graded materials, exploring its properties and potential applications in structural design. This study compares stress and strain results obtained from ANSYS simulations with those derived from Fuzzy analysis. A fuzzy setup is developed with the same condition of input variables. Comparing the results, a lower differential error of 3.85 % is found in the 1 wt % FG-GPL beam's stress behavior. Further, the output results of both methods are taken for sustainability assessment with the assignment of sustainability scores based on different parameters that suggest the methods' feasibility. This study aims to provide a comprehensive understanding of FG beam behavior through advanced simulation methodologies and algorithms, which also aligns with the sustainability of these methods in engineering practice.

37 A Sustainable Design of Bike Ambulance with Side Car for Remote Areas

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This paper proposes a newer bike ambulance design with a sidecar provision for carrying patients, especially for remote areas with transportation difficulties. The design aims to develop a compact, easy-to-manufacture, and efficient bike ambulance. The proposed design can carry a single patient at a time and can carry all the essential and life-saving instruments like care box, element cylinders, stretchers, flasks etc. The suspension has been designed in a way to give maximum comfort at even bumpy roads. Further, Finite Element Analyses have been carried out on the different parts of the proposed design to investigate its feasibility. The main aim of the present study to develop a sustainable ambulance design that can have a better reach, will thereby cut mortality rate in remote areas.

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38 Leveraging Machine Learning for Enhanced Renewable Energy Management and Optimization

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In the quest to reduce carbon emissions and find ways out of the hitches that are resulting from climate change, it is essential to understand the role of integrating renewable sources of energy into the world's energy mix. Controlling and integrating renewable energy sources such as solar and wind into the grid, though important, is highly problematic because of their variability and uncertainty in nature. This paper discusses how to deal with these challenges using machine learning techniques. This study explores the application of machine learning (ML) to enhance the precision of energy production predictions, optimize energy system operations, and ensure grid stability. This paper highlights the potential of ML to transform renewable energy systems by analyzing various case studies, prevailing methodologies, and pinpointing areas requiring further research.

39 Use of Geospatial Technologies for Precision Agriculture- A Review

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Precision agriculture or precision farming, is a modern farming management strategy that involves observing, measuring, and responding to temporal and spatial variability in crops to ensure high yields. This targeted approach leads to improved crop yields, reduced input costs, and sustainable farming practices by minimizing waste and environmental degradation. By integrating tools such as Geographic Information Systems (GIS), Global Positioning Systems (GPS), and remote sensing, government agencies and policymakers can collect and analyse spatial data to make informed decisions about crop management. The use of geospatial data in precision agriculture also facilitates real-time monitoring, yield prediction, and the management of large-scale agricultural operations with greater accuracy. This study reviews how geospatial technologies can help in different aspects of farming such as resource allocation, precise monitoring of soil conditions, crop health, and weather patterns, allowing for targeted interventions that optimize resource use and increase yields. This study also defines the integration of machine learning models and algorithms with geospatial technologies for precision agriculture.

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40 Metal-Organic Framework as Sustainable Solution for Water Remediation: A Review

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Providing safe and clean drinking water by protecting and restoring water-related ecosystems is one of the sustainable goals which has been identified by the United Nations in order to ensure peace and prosperity in the world by 2030. In view of this, removal of various contaminants and toxins from the water ecosystem has become a challengeable problem for the researcher's community. Metal-Organic Framework (MOF) represent an advanced class of coordination compounds, also known as porous coordination polymers, which have garnered significant attention over the past two decades. Their high internal surface area, coupled with remarkable chemical and thermal stability, makes them highly suitable for various applications especially, removal of water contaminants. MOFs have proven effective in removing these toxins through processes like photocatalytic degradation and adsorption. Their structural features, including high porosity, large surface area, and functionalized pores and frameworks, facilitate the diffusion and adsorption of pollutants to the catalytic sites, making them ideal candidates for sustainable environmental applications. This review article focuses on the recent advances in exploration of MOFs for the removal of water pollutants, highlighting their potential in promoting environmental sustainability. The article incorporates removal of different types of contaminants like such as heavy metal ions, radioactive substances, polyaromatic hydrocarbons, pesticides, pharmaceuticals, and carcinogenic dyes, by MOF and their derivative materials alongwith future challenges that need to be addressed for wide applicability of MOFs and related substances. By leveraging these advanced materials, which have promising future applications in this field, MOFs can play a crucial role in developing innovative solutions for environmental protection and sustainability.

41 Towards Environmental Sustainability: A Systematic Review of Green Chemistry Innovations

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This review highlights key areas of chemical science that exemplify the principles of Green Chemistry, particularly the efficient use of materials and energy, development of renewable resources, and design for reduced hazards. Environmental sustainability refers to practices that can be continued indefinitely without depleting non-renewable resources, creating pollution, or exhausting renewable resources.

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Green chemistry, also known as sustainable chemistry, focuses on designing products and processes that reduce or eliminate the use and production of hazardous substances. It has been credited with reducing chemical waste released into the air, water, and land. This field has also inspired new research areas, such as use of green solvents, bio-based transformations, green nanomaterials, alternative energy, molecular self-assembly, next-generation catalyst design, and molecular design for reduced hazard impact on the environment. Various human activities have significantly altered earth's ecosystems, leading to major environmental issues like pollution, land degradation, climate change, water scarcity, and biodiversity loss. These challenges have directly impacted the quality and sustainability of ecosystems, with habitat loss contributing to the mass extinction of species-a critical concern. Data and studies indicate that if current trends continue, environmental conditions will deteriorate further, threatening human civilization. To mitigate this crisis, green solutions, such as the use of microbes, bio-based nanomaterials and biotechnological tools, are gaining importance. These approaches need further attention to help reduce or remediate the harmful effects of human activities, thereby ensuring environmental sustainability.

42 Key Research Areas in Landslide Studies in Indian Himalayas- A Review

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Landslides in the Indian Himalayas represent a significant environmental and socio-economic challenge, further increase by climate change, deforestation, and unregulated development. The region's distinct geomorphology, high seismicity, and monsoonal patterns worsen its susceptibility to landslides, adversely affecting local communities, infrastructure, and ecosystems. So, identifying the critical research areas, challenges, and advancements in landslide studies in the Indian Himalayas is vital. This study aims to identify key research areas in landslide studies in the Indian Himalayas, focusing on methodologies, data sources, data collection techniques, and validation methods. Also, it examines the challenges encountered in different research domains and assesses progress made using both traditional and modern approaches, including geospatial techniques, machine learning and IOT based approaches. The findings of this study highlights the significant advances in mapping landslide susceptibility zones using both traditional and modern approaches. However, there is a clear need for improvements in areas such as rainfall-based and soil deformation-based early warning systems, landslide monitoring, and modelling, particularly regarding data availability, data quality, and methodologies involved. This review offers future researchers insights into key research areas in landslides, gaps involved, and suggests strategies for better improvement in these research domains for advance sustainable development to mitigate the impact of landslides in this vulnerable region.

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43 Evaluation of removal efficiency of some heavy metals by low cost biosorbent: A Sustainable approach.

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The majority of heavy metals are naturally occurring elements in the earth's crust, but the anthropogenic and natural processes leads to their higher concentrations in the environment. The increased levels of heavy metals are toxic due to their difficult decomposition and persistence in the environment for a very long period which causes negative impact on human health and ecosystem. Therefore, in order to minimize their harmful effects on the environment and human health, efficient technologies needs to be utilized for minimizing their impact. For this purpose, two biosorbents, Agaricus bisporus mushroom (ABM) and spent mushroom waste (SMC) have been utilized to eliminate heavy metals Cu (II) and Ni(II) from aqueous medium by biosorption. Batch experiments were conducted in biosorption studies at various operating parameters, with the best results obtainedat pH 5, 0.5 g biosorbent dosage, 6 hours of contact time and at initial concentrationsof 17 and 30 μg/mL for Cu (II) and Ni (II) respectively. For both metals the Freundlich isotherm model and pseudo-second-order kinetic model provided better results to the data obtained. Further the effect of temperature on adsorption capacity of metals has been studied. The thermodynamic parameters, ΔGo and ΔHo indicated the spontaneous and endothermic nature of biosorption process. The biosorbents were characterized by SEM, EDX and FTIR techniques, and revealed the metal ions uptake by ABM and SMC.The biosorption process for the removal of Cu (II) and Ni(II) appears to be cost-effective, eco-friendly, and efficient. The results indicated that SMC has better efficiency to bind Cu (II) and Ni(II) than ABM, and these can be used as an effective biosorbent for removing heavy metals from aqueous medium. The procedural details, salient features of the procedure and the result of findings would be discussed.

44 Investigation on an alternative Sustainable Disc Brake Material for better Braking

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Braking system plays a vital role in ground-based transportation systems. Thus, the structural materials used for the brake system must possess combination of properties like high coefficient of friction, excellent compressive strength, light weight, good resistance of wear, magnificent thermal capacity and economically suitable. Disc brake system produces braking force via the clamp of brake pads on to the rotor which is mounted on the hub. This paper deals with "Steady state thermal and static structural

9 789334 117967

analysis of disc brakes". In order to stop or to slow down the motion of the vehicle disc brake is used. Disc brake works by applying frictional resistance force to rotating disc thereby stopping the vehicle. The current analysis focuses on comparison of two types of disc brake materials e.g., Titanium Alloy and Grey Cast Iron. Based on the Finite Element Analysis (thermal analysis and structural analysis) performed using ANSYS, Titanium Alloy is found to be more suitable as regards to grey cast iron.

45 A Comparative Analysis for an Effective Disc Brake Material for a Sustainable Braking System

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Safety and security of a commuter to a great extend depends upon a good braking system. Literatures have reported various theories and analyses that have been performed so far on this particular domain. The current analysis focuses on a comparative analysis for a suitable disc brake material as an alternative to the conventionally used disc brake materials. Two brake materials were configured for analysis e.g., Aluminium Alloy and Titanium Alloy. Finite Element Analysis (includes the thermal and structural analysis) have been performed and the comparative analysis confirms the efficacy of Titanium Alloy as a better alternative for disc brake material.

46 Si-Based High Energy Density Li-ion Batteries to Minimize Environmental Impacts

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As the need for electrically powered items grows, so does the demand for electrical energy storage. We are now using Li-ion batteries for energy storage, which may not be able to meet the growing demand for high energy density storage for larger applications such as electric vehicles, solar energy storage installations, and electronics. The need for energy storage devices must not compromise the environment, as there is a difficulty with larger battery setups for applications due to the low energy density of the anode and cathode materials utilized in typical Li-ion batteries. As a result of the battery's limited life duration, this issue contributes to large amounts of E-waste. This constraint stems from the material's low energy density. As a result, we need materials with high energy density that can store

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more energy in less area, resulting in less E-waste and contributing to the objective of a sustainable environment. In this study, we will explore silicon as a prospective anode material with high energy density, as well as several production processes and their environmental impact.

47 An Outline of the Several Facets of Environmental Sustainability

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Environmental sustainability is a critical concept aimed at ensuring the long-term health and viability of the planet's ecosystems. At its core, it involves the responsible use and management of natural resources or harm the climate in ways that make life untenable tomorrow. Environmental sustainability is a lifeline for our planet and future generation. Human wellbeing is closely linked to the health of the environment. Around the world, 24% of deaths can be traced back to avoidable environmental factors, according to WHO, people need clean air to breath, fresh water to drink, and places to live that are free of toxic substances and hazards.Sustainable practices encompass a broad range of strategies. These include reducing carbon emissions through renewable energy sources, conserving water through efficient usage and technology, and protecting biodiversity by preserving natural habitats and minimizing pollution. Additionally, sustainability involves promoting circular economies where waste is minimized, and resources are continually reused or recycled, rather than following a linear model of consumption and disposal. Environmental sustainability involves making decisions and taking action that protect the natural word, especially its ability to support human and other creatures' life. Policy and innovation play vital roles in advancing environmental sustainability. Governments and organizations are increasingly implementing regulations and incentives to encourage sustainable practices, such as carbon pricing, subsidies for green technologies, and stricter environmental standards. The Indian judiciary has also played the crucial role in protection and promotion of the environmental sustainability principles in consonance with international laws and policies. This paper draws attention to the importance of public awareness and education in developing a sustainable culture.

9 789334 117967

48 Analysis of glufosinate-ammonium sorption, desorption and leaching potential in various organically altered soils

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The pesticides are used worldwide to boost agricultural production but their excessive use also causes negative environmental effects which are of major concern. When pesticide is applied on crops only a small fraction of it reaches the target area and rest is transported to various environmental compartments like soil and water. The adsorption of pesticides affects the extent of surface and ground water contamination through leaching and has adverse effects on human health due to residues in drinking water. Therefore, from environ mental point of view, the study of adsorption phenomenon and evaluation of leachability of pesticides is of great importance to assess the ground water contamination. Among these pesticides, glufosinate-ammonium is a broad spectrum and non-selective organophosphorus herbicide that is used extensively in agriculture to control weeds on a wide range of crops. The extensive application of glufosinate-ammonium results in serious adverse effects on target and nontarget organisms and can contaminate ground water by leaching through soils. In this work, the sorption-desorption behavior of glufosinate-ammonium herbicide was examined on three soils modified with organic matter at 288 K, 298 K and 308 K. The kinetic data with pseudo-second order and the isothermal data with Freundlich model provided the best explanation for the sorption desorption study. The negative $\Delta G°$ and $\Delta H°$ values indicated the spontaneous and exothermic nature of the sorption process. The groundwater ubiquity score (GUS) values in the range 0.79–1.20 categorized it as a non-leacher pesticide. The results indicated that the temperature and organic amendments had a major impact on sorption-desorption behaviour of the herbicide; and it can be utilized as a good substitute to lessen environmental contamination of glufosinate-ammonium.

49 Advancements in Li-ion Battery Technology and its Cathode towards a Sustainable Future

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The rapid advancement of electric vehicles, renewable energy storage, and portable electronics has placed Li-ion batteries at the forefront of energy technology. However, the environmental impact of battery production, use, and disposal remains a significant challenge. This paper explores recent

9 789334 117967

innovations in Li-ion battery components—cathodes, anodes, electrolytes, and separators, designed to enhance performance while reducing environmental footprints. Special attention is given to cathode materials, where advancements in sustainable synthesis and design are driving improvements in battery efficiency and longevity. These innovations in cathode technology, along with sustainable practices across all battery components, ensure that the next generation of Li-ion batteries can not only meet the growing demand for energy storage but also align with global sustainability goals. The insights presented aim to pave the way for greener, more efficient energy solutions that will drive a sustainable future.

50 Synthesis of Fe2O3 nanoparticles from Ferritin with tunable optical characteristics

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The production of green hydrogen fuel through photoelectrochemical (PEC) splitting of water advances a sustainable environmental solution. The α-Fe2O3 (Haematite) has shown great potential as a photocata-lyst in PEC water splitting because of its abundance on Earth, chemical stability, and exceptional photo-catalytic qualities. In this study, we used controlled heat treatments up to 700 °C to synthesize iron oxide derivatives from Ferritin. The optical properties show substantial fluctuation in absorption spectra due to a large shift in the absorption band edge as a function of annealing temperature. XRD and EDX were used, respectively, to examine the structural and elemental composition. These experiments show that ferrihydrite complexes consolidate into the hematite crystalline phase (α-Fe2O3), demonstrating a relationship between the crystallization and heat breakdown of the organic cage. Furthermore, there is heterogeneity in the electronic excitation processes, such as LMCT, pair excitation, and d-d transition. The process of annealing leads the material to change phases, which shifts a substantial absorption band edge from 2.65 to 1.28 eV. As a result, this band gap engineering in alpha-Fe2O3 provides a technique to produce hydrogen sustainable energy, helping to meet global sustainability goals and paving the way for a cleaner energy future.

9 789334 117967

51 Analysis of glufosinate-ammonium sorption, desorption and leaching potential in various organically altered soils

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The pesticides are used worldwide to boost agricultural production but their excessive use also causes negative environmental effects which are of major concern. When pesticide is applied on crops only a small fraction of it reaches the target area and rest is transported to various environmental compartments like soil and water. The adsorption of pesticides affects the extent of surface and ground water contamination through leaching and has adverse effects on human health due to residues in drinking water. Therefore, from environ mental point of view, the study of adsorption phenomenon and evaluation of leachability of pesticides is of great importance to assess the ground water contamination. Among these pesticides, glufosinate-ammonium is a broad spectrum and non-selective organophosphorus herbicide that is used extensively in agriculture to control weeds on a wide range of crops. The extensive application of glufosinate-ammonium results in serious adverse effects on target and nontarget organisms and can contaminate ground water by leaching through soils. In this work, the sorption-desorption behavior of glufosinate-ammonium herbicide was examined on three soils modified with organic matter at 288 K, 298 K and 308 K. The kinetic data with pseudo-second order and the isothermal data with Freundlich model provided the best explanation for the sorption desorption study. The negative ΔG° and ΔH° values indicated the spontaneous and exothermic nature of the sorption process. The groundwater ubiquity score (GUS) values in the range 0.79–1.20 categorized it as a non-leacher pesticide. The results indicated that the temperature and organic amendments had a major impact on sorption-desorption behaviour of the herbicide; and it can be utilized as a good substitute to lessen environmental contamination of glufosinate-ammonium.

52 structural modifications and electrical properties of Sb doped InSe chalcogenide alloys

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The effect of Sb doping on the physical, structural, electrical properties of InSe chalcogenide alloys has been studied. The bulk samples of In0.1Se0.9-xSbx are synthesized using conventional melt quenching technique. The physical parameters such as average coordination number, number of constraints, floppy modes, mean bond energy, cohesive energy and band gap are calculated theoretically. For

9 789334 117967

structural analysis XRD and FTIR techniques are utilized. The XRD results showed the coexistence of two crystalline phases in the synthesized InSeSb samples viz. rhombohedral α-In2Se3 and orthorhombic Sb2Se3 phases. FTIR spectrum revealed the bonding arrangement and confirm the presence of In-Se, Se-Se and Se-Sb bonds in the system. The electrical properties of the alloy system are studied using I-V characterization, which showed an increase in the value of conductivity with rise in temperature. A strong correlation has been established between these experimental results and the physical parameters, providing a comprehensive understanding of the doped alloy system.

53 Repurposing Athyrium filix-femina acetone extract as antimicrobial agent against bacterial pathogens

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The attempt to look for novel antimicrobial medications is becoming necessary due to the growing resistance of bacterial infections to traditional antibiotics. This study aims to determine whether acetone extract from Athyrium filixfemina, or lady fern, has antibacterial properties against various bacterial infections.Cold maceration in acetone as a solvent produced the extract, which was then concentrated and subjected to phytochemical examination and synthesis and Characterization of silver nanoparticles (AgNP's). Salmonella typhi, Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, Proteus vulgaris, and Escherichia coli were among the bacterial strains against which the antibacterial activity was checked using the agar well diffusion method. According to the results, the acetone extract significantly inhibited the growth of every examined bacterium, with zones of inhibition comparable to those of conventional antibiotics. The phytochemical evaluation approach identified bioactive compounds comprising tannins, flavonoids, and saponins, which were responsible for their antibacterial potential. The synthesized silver nanoparticles were further checked for their in vitro antibacterial efficacy, and Characterization was performed. Athyrium filix-femina acetone extract could serve as a natural source for the synthetic production of novel antimicrobial compounds, as these results indicate that it has powerful antibacterial properties.

9 789334 117967

54 Monitoring and analysis of Dimethoate insecticide in environmental samples

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To combat the needs of ever increasing world's population and to prevent food losses from pests, pest control is an essential component of modern agriculture. Pesticides include herbicides, insecticides, fungicides, rodenticides, and molluscicides. Among these, insecticides are the second most frequent pesticide used worldwide, following herbicides. Dimethoate is a widely used insecticide which belongs to organophosphorus family and is used to control insects and mites in a wide range of crops, including citrus, cotton, fruit, olives, potatoes, tea, and vegetables. Because of the extensive use of dimethoate it can be accumulated in environment and causes detrimental effects on human health and on non-targeted species. Therefore, it is essential to frequently check its residues in food and the environment to avoid its environmental contamination. In this regard, we have developed a simple, sensitive, and economic spectrophotometric procedure for assessing dimethoate in pure form and in environmental samples. The method is based on the alkaline hydrolysis of dimethoate to thiol, which exhibit specific coloured complex formation processes with ferric chloride in the presence of 1, 10-phenanthroline exhibiting maximum absorbance at 488 nm. The proposed approach can detect dimethoate in a linear range of 0.458-13.7 μg mL-1. The method was validated on its commercial formulations and in environmental samples viz. vegetables, grains and water. The method was also applied to study the adsorption behaviour of dimethoate on a soil sample at three different temperatures (25°C, 35°C and 45°C) to study the behaviour of dimethoate with variation in temperature. The procedural specifics will be discussed in detail.

56 Educational Strategies for Promoting Environmental Literacy: A Review of NEP 2020

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Environmental literacy must be possessed by every human being, to effectively address the serious global environmental issues. The need of environmental literacy in solving today's environmental challenges is becoming more widely understood. National Education Policy (NEP) 2020 in India emphasizes the importance of integrating the sustainable and environmental awareness throughout the school curriculum from a very young age. This study reviews NEP2020's framework for promoting and integrating environmental literacy into education system and analyzing its impact on students, teachers and communities. It focuses into the goals and strategies of NEP2020 on how it intends to incorporate

9 789334 117967

environment literacy into the educational curriculum. Based on preliminary results, NEP2020 may help in developing a new generation of environmentally conscious citizens. The study also highlights how NEP2020 aligns with the global educational trends which place a strong emphasis on sustainability and deep understanding of environmental issues. The paper investigates into modification of the curriculum, methods of instructions and evaluation of the tools meant to improve the environmental literacy. The initial findings suggest that NEP2020 has the ability to foster environmentally conscious citizens and its alignment with global standards of excellence. The paper suggests some educational strategies for promoting the environmental literacy. The study further highlights the effective implementation of NEP 2020 and suggests the educators, decision makers and other stakeholders to successfully execute the environment literacy in the education system.

58 Integrating Renewable Energy Solutions for a Sustainable Environment: Challenges and Opportunities

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In order to achieve a sustainable environment, this study paper looks at how renewable energy solutions might be integrated. With an emphasis on the social, economic, and environmental effects of adopting renewable energy technology, the study attempts to investigate the potential and problems related to this process.

1. To assess how well different renewable energy sources contribute to environmental sustainability is one of the main goals of this research.

2. To determine what obstacles stand in the way of renewable energy technology being widely adopted.

3. To investigate possible ways to get beyond these obstacles.

4. To evaluate how technology developments and policy frameworks contribute to the integration of renewable energy.

The research employs a mixed-methods approach, combining quantitative analysis of energy data with qualitative insights from expert interviews and case studies. Quantitative analysis will include the evaluation of energy production and consumption patterns, as well as carbon emission reductions across different regions. Qualitative analysis will focus on stakeholder perspectives and the effectiveness of existing policies. The findings are expected to offer valuable insights for policymakers, industry leaders, and researchers in advancing the adoption of renewable energy for a sustainable future.

9 789334 117967

59 Quaternized P. ovata as a highly efficient adsorbent for selective adsorption of Congo red

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To develop new green sustainable adsorbent, herein, P. ovata, a polysaccharide, was transformed into a cationic material by introducing a quaternary ammonium group in its structure through a two-step process. The latter was characterized using various techniques including Fourier transform infrared spectroscopy (FTIR), Field emission scanning electron microscopy (FESEM) linked with Energy dispersive X-ray (EDX), X-ray diffraction (XRD), Thermogravimetric analysis (TGA) and surface charge analysis and assessed as adsorbent of Congo red. The maximum % adsorption (Pr) of 94.44%, was reported for CR within 70 min The adsorption process adhered to the pseudo-second-order kinetics and Langmuir isotherm, exhibiting a maximum adsorption capacity (qm) of 260.41 mg/g for CR. Quaternized P. ovata showed high recyclability as even after twelve cycles of adsorption and desorption, the adsorbent maintained significant dye removal (more than 50 %) with cumulative q of 932.83 mg/g for CR. Hence, the adsorbent developed by a green protocol is low-cost, efficient, and environmentally sustainable.

60 Sustainable Development Policies around the Globe: Some Reflections

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Sustainable development has become a global imperative, necessitating policies that balance economic growth, environmental protection, and social equity. This research article reflects on the diverse approaches countries across the globe have taken to implement sustainable development policies. By analyzing case studies from various nations, we aim to provide insights into the successes, challenges, and lessons learned in the pursuit of sustainability. This comparative analysis underscores the importance of context-specific strategies while highlighting common principles that can guide global efforts toward a more sustainable future.

9 789334 117967

61 A Systematic Review Examining Sustainable Development Policies and Practices Recommendations in India

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Sustainable development has become a crucial aspect of India's policy agenda, given the country's unique socio-economic and environmental challenges. This paper conducts a systematic review of India's sustainable development policies and practices, focusing on key areas such as climate change mitigation, renewable energy, water conservation, and social equity. Through a detailed examination of national and state-level initiatives, including the National Action Plan on Climate Change (NAPCC), the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), and the National Solar Mission, this review highlights both the successes and challenges in implementing sustainable development strategies. The findings reveal that while India has made significant progress in areas like renewable energy and community-based conservation, it still faces substantial barriers in terms of policy integration, financial constraints, and institutional coordination. The paper underscores the importance of adopting integrated approaches that harmonize economic growth with environmental sustainability. Furthermore, it emphasizes the need for robust stakeholder engagement, particularly at the grassroots level, to ensure that policies are not only well-designed but also effectively implemented. Innovative financial mechanisms, such as green bonds and public-private partnerships, are identified as critical tools for bridging the funding gap in sustainable development projects. The paper concludes with practical recommendations for policymakers and practitioners, including enhancing capacity-building efforts, improving monitoring and evaluation systems, and leveraging technology to drive sustainability. By addressing these challenges, India can make more substantial strides toward achieving its sustainable development goals and serve as a model for other developing nations.

62 Sustainable Pathways: Unveiling the Nexus of Environmental Concerns, Government Initiatives, and Generation Z's Adoption of Solar Technologies

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Focus of the article: The present study aims to elucidate the young consumers (Generation Z) intentions to adopt STs. Research questions: (1) how do environmental concerns, government initiatives, and TPB

9 789334 117967

constructs impact attitude and behavioral intention to adopt STs? (2) How does conservation behavior drive the successful adoption of STs among customers? Methods: Data were collected from 372 Indian college and university students using convenience sampling. Structural Equation Modeling was applied through SmartPLS software. Additionally, IBM SPSS software was used for descriptive analysis. In addition, twenty semi-structured interviews were performed to get further insights into customers' conservation behavior. Results: The results revealed that constructs such as environmental concern, government initiatives, SNs, and attitudes have a significant effect on the customers' intentions to adopt STs in the Indian context. In contrast, the PBC construct had a negligible effect on customers' intentions, which means respondents believe STs require a substantial initial investment, maintenance, technical expertise, and frequent panel cleaning, making them less popular among customers. Recommendations for practice: Based on results, marketers must disseminate information on STs' availability, varieties, safe cleaning methods, and acquisition mode. To build up the PBC, infomercial ads highlighting the performance of STs to persuade initial trial behavior can be developed. Originality- Though some studies were undertaken in the social context of solar energy, young consumers' intentions have not been studied yet. Therefore, the present study fills this gap and analyzes the students' intention toward STs. These results will be helpful for researchers, solar manufacturers, practitioners, government, and policymakers.

65 Matrix Models in Population Dynamics: Exploring Structure and Applications

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Population dynamics is characterized by differential equations between the birth sizes of consecutive periods. This paper provides an overview of matrix models in population dynamics, focusing on population transitions, the Leslie matrix model, the SIR model, applications, and extensions. It discusses key findings and emphasizes the usefulness of matrix models in understanding and predicting population dynamics. The paper explores sensitivity analysis to examine the impact of birth rates, death rates, and migration on populations. It also addresses the effects of age-specific fertility and mortality rates on population growth and the prediction of population structure using stable age distribution. Extensions include stage-structured models, density-dependent models, and metapopulation models. The paper concludes by summarizing insights gained from matrix models and their importance in studying population dynamics.

9 789334 117967

66 Significance of Hybrid Manufacturing and its Technologies in the field of Manufacturing and Design Industry

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Additive manufacturing (AM) has become a significant part of today's world's manufacturing and design industry. With the increase in demand for upgrading the technology to create complex and customized products with flexibility in the machinery, now the industry needs the usage of such technologies that can do better than the conventional one and needs less power, high productivity, better surface finish, and many more advantages. Due to these demands, Hybrid Manufacturing (HM) has come into existence as a turning point for the manufacturing industry. This paper strives to define HM with the help of the definition of researchers, a table based on different hybrids and work done by the different researchers in the last decades, defining and comparing major processes of HM, namely Laser metal deposition (LMD), Metal powder, Sheet lamination and Power bed fusion (PBF) in the form of a table, followed by a discussion on limitations and future scope.

67 Exploring the Significant Advancements and Potential Applications of Additive Manufacturing in Industry

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The multidisciplinary exploration zone of Additive Manufacturing has recently risen strongly and rapidly, and it is projected to continue. The worldview of personalized things is now beginning to play out as envisaged, thanks to the introduction of new additive manufacturing technology. This is a watershed moment in a new era of precision products, which have become easier to produce and apply as a result. "Industry 4.0," which refers to a current trend in automated intelligent technology, is an example of this. Using Additive Manufacturing's present capabilities in the context of information technology integration is critical in this new era for sustaining industrial economic competitiveness and assuring long-term success. The Fourth Industrial Revolution must allow for improved interaction between humans and robots to achieve more effective and faster solutions. It not only ushers in a new era of customizing, but it also provides a solution to difficult situations. Additive manufacturing is critical in the transition to Industry 4.0 because of its flexibility, ability to save time and money, and

9 789334 117967

ability to be conclusive in gauging efficacy. It also helps to reduce complexity by using quick prototyping and unusually decentralized production processes. The use of additive manufacturing research in a wide range of industrial applications is currently under study.

68 A Comprehensive Review on Production of Biofuels

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An alternative to fossil fuels is a need of the hour. Biofuels are an important alternative to fossil fuels, providing a renewable source of energy that can help reduce greenhouse gas emissions and dependence on non-renewable resources. However, based on the type of feedstock used, biofuels are classified as first generation, second generation, third generation, and fourth generation. The first category includes major food crops and edible oils, while the second has lignocellulosic agricultural waste matter, the third category is rich in algal biomass, and the fourth generation has recombinant and genetically modified alternatives, as genetic engineering might hold the key to making biofuel production more cost-effective, sustainable, and scalable to meet global energy demands. Hence, this review broadly focuses on the potential sources of biofuels and the technology & strategies employed for the production of biofuels.

69 Various Geotechnical Parameters Characterization of Clayey Soil using Pond Ash and Nylon Fiber

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Clayey soil is an expansive soil that expands when it comes in contact with water. This is the major reason for failure of clayey soil strata. It is an incredibly challenging task to construct structures over soils possessing poor geotechnical characteristics. The present study is focused on improving the geotechnical properties of clayey soil using pond ash and nylon fiber. Pond ash is the residue after the combustion of coal in thermal power plants. Nylon fibers are tough, possess high tensile strength, as well as elasticity and luster and have excellent abrasion resistance. Firstly, the geotechnical properties

9 789334 117967

of expansive soil in its natural state are calculated then various percentages of both materials, i.e., pond ash varying from 10 to 25% and Nylon fiber varying from 0.5 to 2% by weight is added to improve the strength of clayey soil. Various tests were performed to find out the optimum proportion of above two materials in order to improve the strength of clayey soil such as Atterberg limit, Compaction, Unconfined compressive strength (UCS) and California bearing ratio (CBR). MDD decreased and OMC increased on increasing the percent of Pond Ash and Nylon Fiber. When pond ash and nylon fiber are mixed together, the UCS and CBR value increased. For microstructural analysis, X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD) analysis were performed. XRF analysis is used to determine the elemental composition of a sample. XRD analysis, on the other hand, is a technique used to analyze the crystal structure of a sample.

70 How do Income inequality, Poverty and population growth impact the environmental degradation in India: unveiling the reality

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This study attempts to examine the main forces affecting short-run and long-run ecological footprint patterns due to changes in income inequality, poverty and population growth in India from 1995 to 2019. For this purpose, the study uses the autoregressive distributed lag (ARDL) cointegration technique and the stationary properties of the variables are checked using the ADF and Phillips Perron test. The results of the ARDL bounds test confirm the long-run relationship among the variables. Further, the ARDL coefficient confirms that poverty and population growth increase ecological footprint in both the short and long run whereas income inequality also highlights the positive but insignificant relationship with ecological footprint in India. The study suggests that policymakers should prioritise efforts to alleviate poverty and decrease income inequality by focusing on redistributive transfers, ensuring universal access to health and education, implementing progressive taxation, empowering women, and enforcing the Clean India mission. These measures are expected to positively impact the reduction of environmental degradation in India. Additionally, the study advocates for the implementation of robust environmental regulations that can significantly drive innovations aimed at improving energy efficiency and subsequently lowering Ecological footprints.

9 789334 117967

71 Artificial Intelligence in Agriculture: A Comprehensive Review of Machine Learning and Deep Learning Applications

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The use of the artificial intelligence, especially in the fields of Machine Learning (ML) as well as Deep Learning (DL) is powerful in enhancing the benefits derived from precision agriculture, for instance, increasing crop yields, evaluating the health of plants, and managing resources. This review studies present literature from 2020 to 2024 and analyses the comparison of ML and or DL models in the area of detection of diseases, identification of pests, and water management. Our findings show that ML solution models such as Random Forests and SVM work better in small datasets while DL solution models like CNNs and YOLO v8 work better in big, complex, image based tasks. But still, these fields are plagued by issues like data scarcities, the expense of computation, and lack of interpretability of the model. In this regard, we also examine how newly emerging technologies such as edge computing and explainable AI might overcome these challenges and justify AI as key technology in the advancement of agriculture in the future.

76 A Review of the Optimization of Turning Parameters on Various Steel Grades

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The impact of cutting parameters in the turning process primarily affects the surface roughness, material removal rate cutting forces and tool wear. The rising competition to increase productivity with high quality surface finish has formed the need to choose high quality machining tool. The significant cutting parameters in turning process are commonly cutting speed, depth of cut, feed rate and spindle speed these are the factors that affect the surface roughness and material removal rate of the finished material. The purpose of this study is to evaluate the work on optimizing turning parameters during turning operations on various steel grades. The key input parameters in separate publications were cutting speed, feed rate, and depth of cut, whereas the output parameters were cutting forces, tool wear, surface roughness, and material removal rate. Various researchers have investigated Taguchi and RSM (Response surface methodology) techniques for parameter creation and optimization. In order to determine whether input parameters had a substantial impact on performance characteristics,

9 789334 117967

researchers utilized ANOVA (Analysis of variance) in their study. In their individual studies, researchers used the Signal to Noise (S/N) ratio to quantify the variances in experimental data. This study was mainly focused on determining the most prompting input parameter for good or undesired outcome; nonetheless, the primary goal was to pick optimal parameters for enhanced surface quality and low material loss rate.

77 Sustainable Functional Coatings via Versatile Advanced Analytical Instruments (SEM, TEM, AFM, AAS, XPS, DMTA, TGA and DSC) for Energy and Environmental Applications

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Functional coatings are known for providing better adhesion, corrosion resistance and durability, and several other factors such as composition, application technique, substrate properties etc., make them fairly complex. The degree of knowledge regarding their composition and mechanism of substrate interaction is needed in order to maximise their application. The application of these techniques, which include SEM, TEM, AFM, AAS, XPS, DMTA, TGA and DSC is complementary to the design and functional characterisation of coatings. High-resolution images are provided (SEM) to study the coating form and identify defects, complemented by detailed analysis at the nanoscale level (TEM) characterizing exclusively the microstructure property. AFM studies the topography and adhesion properties of surfaces while AAS is used for elemental analyses. It provides information on which chemical forms and how these interact with the substrate.XPS DMTA and TG are used for mechanical and thermal survey, respectively; DMTA is meant to ascertain the viscoelastic behavior whereas TGA are supposed to confirm the thermal stability. DSC (glass transition temperature and other thermal characteristics) On the whole, this suite of tools gives crucial knowledge to comprehend the mechanical, chemical and microstructural physics behind coatings yielding in durable coated films which can meet industrial needs. The ability of a functional coating to perform is greatly affected by the substrate, how it can be applied and also what performance enhancing materials are in the mix. Considering these coatings, it is important to understand the nature of the coatings and their substrate interaction. ADE is an extensive method requiring the utilization of various sophisticated tools such as SEM, TEM, AFM, AAS, XPS, DTS/NMR TGA and D SC. A high-resolution image, on the nanoscale level, of the microstructure can be obtained using TEM; coating shape and spot defects are analysed using SEM.

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81 Machine Learning for Road Safety: Predicting Accidents through Data Analysis & Visualization Techniques

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Global traffic accident rates are rising, necessitating the implementation of efficient preventive measures. This paper offers a machine learning method to forecast traffic accidents by using past data, current weather, and other environmental variables. Using a variety of datasets and methods, several machine learning models were trained to identify the likelihood of an accident in real time. Furthermore, high-risk areas and time periods were represented using data visualization techniques, providing policymakers and traffic management systems with insightful information. Road safety modelling is a useful tactic for encouraging safe mobility since it makes it possible to create crash prediction models (CPM) and look into the variables that influence the likelihood of crashes. Although the limits of this type of approach (particular assumptions and prior description of the link functions) have been acknowledged, statistical techniques have been employed in this modelling traditionally. This offers a chance to investigate alternatives, such as the use of machine learning (ML) techniques. This study examines publications that developed CPM using ML approaches. Following the implementation of a comprehensive literature review procedure, papers were analyzed and organized.

82 Impact of pharmaceuticals on wastewater on treatment

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Personal hygiene and pharmaceutical goods can pose hazards to both human beings and the ecosystem at large. Treatment facilities for wastewater in particular are frequently able to identify new pollutants that interfere with the process of biological treatment. In comparison to more sophisticated treatment techniques, the method of activated sludge is a conventional biological technique with lower capital costs and less operating needs. Additionally, a membrane-based module and the bioreactor are combined in the membrane bioreactor, which is a widely utilised cutting-edge technique for purifying pharmaceutical waste water with good pollutant performance. Anaerobic techniques for drug breakdown that are low in cost, low in nutrients, low in surface area, and effective are made easier to pick by wastewater's substantial organic matter content, which also lowers pollution. However, in order to enhance biological treatment, scientists have resorted to hybrid processes, which combine chemical,

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physical, and biological methods of treatment in order to efficiently eliminate a variety of newly emerging pollutants. On the other hand, in order to enhance biological treatment, scientists have resorted to hybrid processes, which combine various chemical, physical, and biological methods of mitigation to efficiently eliminate a range of newly emerging pollutants. In order to evaluate which treatment strategy will work best for our research, this document enumerates the various biological therapy strategy.

83 Biomass Energy: A Comprehensive Review and Future Prospects

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The global population of the entire globe is expected to reach 9 billion by 2050, having doubled from 1960. The population is still growing at a rapid rate. As a result of these circumstances, cities are now using a significantly larger portion of the worldwide energy supply. A resource called biomass can be found in a wide range of substances. Historically, resources from biomass have been used; however, because of the potential for economic gain and the large amounts of crop production that occur each year, their byproducts—which can be used as a source of energy—are even being marketed as ""energy crops"" (so-called because of their potential).

85 Effect of Dysprosium on magnetic properties of Z-type Hexaferrite

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Sol-gel auto-combustion process was used to fabricate Dysprosium and Indium doped Co2Z hexaferrite Ba3Co2InyDyxFe23.9-xO41 (where x = 0.0, 0.05, 0.1, 0.15, 0.2 and y = 0.1). The produced samples feature a pure Z-type phase, as confirmed by the structural investigations performed using XRD and TEM. The magnetic research was carried out by Vibrating sample magnetometer and Mossbauer spectroscopy These samples' magnetic hysteresis loop provides us with the value of the coercive field, saturation magnetization, and remanence magnetization; based on these data, we discovered that at 89.065 emu/g, Ba3Co2In0.1Dy0.2Fe23.7O41 has the greatest saturation magnetization value. From Mossbauer spectrums we found that presence of the Fe3+ state in the sample and the lack of lattice site deformation

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caused by doping with Dysprosium and Indium as the magnetic field varies significantly are revealed by Mossbauer spectra fitted with six sextets of six sites by least square fitting provides details regarding the existence of the Fe3+ state in the sample and that doping with does not cause any deformation in the lattice locations.

86 Simulation Study of SS-316 Powder Chisel Casting via Microwave Energy: A Multi-Physics Approach

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Microwave energy is an emerging technology in the pursuit of sustainable development across multiple industries. By facilitating rapid heating and uniform energy distribution, microwave processing minimizes energy consumption compared to conventional methods. Applications range from food processing to waste treatment, material synthesis and processing showcasing its versatility. Microwave casting is an innovative process that utilizes microwave energy to enhance traditional metal casting techniques. This approach is gaining traction in sustainable development due to its efficiency and reduced environmental impact. While microwave casting offers significant advantages for sustainable manufacturing, there are some challenges for its successful implementation and broader adoption. In this context, simulation plays a crucial role in optimizing the microwave casting process, offering several advantages that enhance understanding, efficiency, and outcomes. In this study, a 3D finite element (FE) model of the microwave casting experimental setup has been designed to cast a chisel using SS-316 powder. The exposure time to cast the chisel in an electromagnetic environment is predicted through FE simulation. The microwave heating effects are also analyzed using electric field strength, resistive heating and thermal contour.

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87 Multi-Physics Analysis of SS-316 Powder Spanner Casting Using Microwave Energy

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Microwave energy is an emerging technology that supports sustainable development across industrial applications. By enabling quick heating and consistent energy distribution, microwave processing reduces energy consumption in comparison to traditional methods. Microwave energy serves as a versatile heat source for food processing, material synthesis and medical treatments. Microwave casting is an advanced technique that harnesses microwave energy to enhance traditional metal casting methods. This method is becoming increasingly popular in sustainable development because of its efficiency and lower environmental impact. But there are some challenges for its effective implementation and wider adoption. In this context, simulation is vital for optimizing the microwave casting process, providing numerous benefits that improve understanding, efficiency, and results. This study involves the creation of a 3D finite element (FE) model of the microwave casting experimental setup, specifically designed to cast a spanner using SS-316 powder. As per selected process parameters, the exposure time required to cast the spanner in an electromagnetic environment is estimated using FE simulation. Moreover, the impact of microwave heating is investigated by analyzing electric field strength, resistive losses, and thermal profile.

88 Microwave Casting of an Aluminium Door Handle: A Multiphysics Simulation Approach

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Microwave-assisted casting is an advanced technique where microwave energy is used to melt and shape materials. Microwave casting promotes sustainability through energy efficiency, waste reduction, and enhanced product quality through its volumetric heating characteristics. Conventional casting methods are based on external heat sources, but microwave heating offers a fast, energy-efficient

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alternative through direct interaction with the material. This study investigates the novel application of microwave energy in metal casting. In the present study, a 3D finite element (FE) model of microwave-assisted casting setup is designed using COMSOL Multi-physics software to cast an aluminum door handle. The FE model comprises a household microwave oven and refractory brick cast setup. The casting is performed using an applicator with a power output of 900 W and a frequency of 2.45 GHz. The simulation incorporates thermal, electromagnetic, and mechanical physics to represent the complex interactions during the casting process. As per the selected process parameters, the exposure time to cast an aluminum door handle inside the applicator cavity is optimized through FE simulations. Microwave heating impacts are also analyzed in terms of electric field intensity, joule heating, and conductive heat transfer and temperature distribution within the applicator cavity.

89 Multi-physics simulation study to microwave cast Allen key of stainless steel

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Microwave casting is a new technique where microwave energy is used to melt and shape materials. Microwave casting promotes sustainability through energy efficiency, waste reduction, and enhanced product quality through its uniform heating characteristics. An Allen key is commonly used for driving fasteners with hexagonal sockets. It features an L-shaped cross-section and is integral to machinery assembly. In this study, a 3D finite element (FE) model of a microwave-assisted casting setup is developed using COMSOL Multi-Physics software to manufacture a stainless steel Allen key. The FE model incorporates a household microwave oven and a refractory brick casting setup. The casting process utilizes an applicator with a power output of 900 W and a frequency of 2.45 GHz. Through FE simulations, the exposure time required for effective casting of stainless steel Allen key within the applicator cavity is optimized. The effects of microwave heating on the material during the casting process are thoroughly analyzed.

9 789334 117967

90 Structural and Morphological Study of a Smart Material Potassium Sodium Bismuth Titanate (KNBT) for Environmental Sustainability

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Lead titanate-zirconate (PZT) piezoceramics are the most utilized smart materials till now. However, the environment and human health are seriously threatened by the PZT composition's lead content, which exceeds 60%. As such, more efforts are being undertaken to provide lead-free substitutes for materials based on PZT. In this case, we suggest that for high temperature applications, lead-free piezoceramics, KNBT are a viable substitute for hazardous lead compounds. A sol-gel approach is applied to prepare an environment friendly Potassium Bismuth Titanate (KNBT) ceramics, with the general formula (1 - x) K0.5Bi0.5TiO3 -xNa0.5Bi0.5TiO3. Effect of calcination temperature is analyzed in structural and morphological studies for high temperature applications. KNBT is a promising alternative to lead based perovskite structure with various high temperature applications. In this study, to investigate the high temperature effects on KNBT, Raman spectroscopy and X-ray diffraction study is done to get the structural properties of the material. The structural studies show a fine perovskite structure with no secondary phases. Morphology of the samples is found to depend strongly on composition. A change of composition results in a phase change, as evident from X-ray structure analysis. Both NBT and KBT exhibits high Curie temperature around 320^{o}C and 380^{o}C respectively, which hints to the idea that KNBT can be beneficial for high temperature applications. KNBT-based piezoceramics, should be seriously considered as candidates for the replacement of the current toxic lead-based compound.

92 Inhibition of Mild Steel Corrosion using Synthesized Silver Nanoparticles

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The manuscript represented the successful application of corrosion protection of mild steel (MS) substrate with silver (Ag) nanoparticles. The silver nanoparticles were synthesized by using Nicotiana tabacum leaf extract. The crystal size of Ag nanoparticles was evaluated by XRD characterization. Corrosion study of mild steel substrate was determined in 3.5% NaCl and 0.1 M HCl corrosive medium. Anticorrosive performance was examined by polarization experiment. The corrosion efficiency of silver nanoparticles coated substrates were 94.27 % and 96.30 % in 0.1 M HCl and 3.5% NaCl solution

9 789334 117967

respectively. The surface morphology of the substrate was evaluated by Confocal Laser microscopy. The results showed that the silver nanoparticles exhibit good corrosion efficiency.

93 Influence of ZnO on Structural Properties of Environmental Friendly K0.5Na0.5NbO3 Piezoelectric Ceramics

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Pb-free piezoelectric ceramics are in current demand due to their environmental friendly nature. Among Pb-free piezoelectric materials, K0.5Na0.5NbO3 ceramics have great potential due to replace Pb-based PZTs ceramics due to its comparable and excellent properties. Pb-free K0.5Na0.5NbO3-ZnO ceramics were prepared by using solid state route at different mol% of ZnO. The influence of ZnO concentration on structural properties of K0.5Na0.5NbO3 ceramics were investigated systematically. The structural properties revealed stable perovskite phase along with secondary phase of Zn metal ions. The peak intensity in Raman spectrum decreases with increase in ZnO concentration due to non-perovskite phase of Zn2+ ions. The surface morphology analysis revealed that ZnO content promotes the growth of grain size in KNN-ZnO ceramics.

94 Enhancing magnetic properties of M-type Ferrite with Aluminium-Neodymium doping for EV's PM Motors

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The increasing demand for electric vehicles (EVs) is hindered by the high cost of rare earth magnets, such as NdFeB. M-type strontium ferrite offers a promising alternative due to its cost-effectiveness and excellent magnetic properties, making it suitable for EV motor applications. This study investigates the synthesis and characterization of Neodymium-Aluminium co-substituted M-type hexaferrite (Sr1-xNdxAlyFe12-yO19, with $0.00 < x < 0.20$ and $0.00 < y < 2.00$). Magnetic particles were synthesized using the sol-gel auto-combustion method, followed by calcination at 1100 °C for 4 hours. Structural analysis via XRD and HR-TEM confirmed the polycrystalline nature of the material. Increased doping concentrations resulted in a reduction of crystallite size from 104 nm to 61.33 nm (XRD) and particle size from 139 nm to 104 nm (HR-TEM). Magnetic measurements revealed that Al3+ and Nd3+ doping significantly enhanced coercivity by 45.45%, from 5.5 kOe to 8 kOe, comparable to NdFeB. This

9 789334 117967

improvement is attributed to the controlled reduction in particle size during synthesis. These findings highlight the potential of optimizing magnetic properties through precise dopant concentration control in M-type hexaferrites, positioning them as viable alternatives to rare earth magnets.

95 Integrating Sustainable Development Goals in the Education of Students with Disabilities

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This article investigates the incorporation of the Sustainable Development Goals (SDGs) into the education for students with disabilities, emphasizing the transformative power of inclusive education within the global sustainability framework. The United Nations' SDGs, specifically Goals 4 (Quality Education) and 10 (Reduced Inequalities), provide the groundwork for making educational systems more inclusive and accessible for students with disabilities. However, educational access is still limited due to infrastructural, pedagogical, and sociocultural constraints. The research focuses at how incorporating principles of sustainability can improve educational methods for students with disabilities. It focuses on new approaches to disability education that are aligned with the SDGs, such as universal design for learning (UDL), assistive technologies, and inclusive curriculum. These initiatives promote social inclusion and reduce inequities, so contributing to sustainable growth. There is a discussion of the roles that legislators, teachers, and institutions play in putting into practice sustainable educational reforms, with a focus on how multidisciplinary collaboration may assist disabled students' full participation. The study includes examples of successful models from many countries that show how schools and educational institutions are incorporating sustainability to meet the diverse requirements of students with disabilities. Furthermore, the study calls for a paradigm shift in education policy and practice, pushing stakeholders to recognize that inclusive education is critical to attaining long-term sustainability. By integrating educational frameworks with the SDGs, we can build resilient, inclusive societies in which students with disabilities are empowered to contribute to sustainable development.

9 789334 117967

96 Education for Sustainable Development and its Role in the Promotion of the Sustainable Development Goals

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The Sustainable Development Goals emerged as universal goals aiming to promote more inclusive societies, fighting inequalities and recognizing the importance of cooperation. Based on a human rights approach, the idea is to pursue sustainable development along with human development, stressing the importance of each of the 17 goals set by the 2030 Agenda and how interconnected they all are. At the same time, Education for Sustainable Development is pursuing similar goals, including gender equality, health promotion and climate change action. The main purpose of this paper is to understand how Education for Sustainable Development can assist in the achievement of the Sustainable Development Goals. In addition to a literature review, a discussion is conducted from the presentation of each Sustainable Development Goal and how they can be explored through education. As a safe environment, Education Institutions are a platform that should be used for debates, especially the ones related to the challenges society has to face in the future. In this context, Education for Sustainable Development carries important tools to enable the learners not only to be prepared for what their lives and career will require, but also to contribute for a more Sustainable Development Goals requires only the willingness of education leaders and stakeholders to adjust their curricula and engage the teaching body towards the change our world demands.

97 Structural, Optical and Cation Distribution of Ni(Co0.02Cu0.02Mn0.1Fe1.8)O4 Ferrite Synthesized by Metal-Organic Decomposition Method

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Nickel ferrites are gaining attention for their potential in magnetoelectric composite ceramics due to their high magnetostriction and electrical resistivity. The preparation method and other synthesis parameters have a significant impact on the properties of ferrites. In this perspective, the metal-organic decomposition (MOD) approach is utilized for the first time to synthesize Ni(Co0.02Cu0.02Mn0.1Fe1.8)O4 ferrite. Herein, the effects of Co, Cu, and Mn substitution on the structural, microstructural, and optical properties of nickel ferrite have been investigated. X-ray diffraction (XRD) analysis confirms a pure single-phase cubic spinel structure (Fd3m), with Rietveld refinement supporting phase purity through refined atomic parameters and cation distribution. The

9 789334 117967

XPS quantifies cation distribution and oxidation states of Ni, Co, Cu, Mn, and Fe in both octahedral and tetrahedral sites. Raman spectroscopy corroborates the phase structure, while field emission scanning electron microscopy (FESEM) and energy dispersive spectroscopy (EDS) reveal grain morphology and elemental composition. The elastic properties are analyzed using FTIR spectroscopy. Optical properties were analyzed using UV-Vis data and indicate a direct band gap of ~3.78 eV, Urbach energy of ~1 eV, and a refractive index of ~1.74. This research enhances understanding of how synthesis methods influence cation distribution, site preferences and various other properties of Ni(Co0.02Cu0.02Mn0.1Fe1.8)O4 ferrite.

99 Innovative Concrete Materials: Utilizing Crushed Bricks for Aggregate Replacement

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The study explores the feasibility of using crushed bricks as a partial substitute for natural coarse aggregate in concrete, addressing the growing scarcity of natural aggregates in the construction industry, which poses both economic and environmental challenges. Crushed bricks, sourced from demolition waste, offer a sustainable alternative. In this experiment, M20 grade concrete was produced with 10%, 20%, 30%, 40%, and 50% of the natural coarse aggregate replaced by crushed brick aggregates. The effects on compressive strength, tensile strength, and workability (measured by slump value) were assessed after 7 and 28 days of curing. Additionally, bulk density and stress-strain behavior were analyzed. The results showed that up to 30% substitution maintained compressive and tensile strength comparable to conventional concrete, with only a minor decrease in workability. Beyond 30%, performance significantly declined, indicating limitations at higher replacement levels. These findings suggest that crushed bricks can be effectively used in non-structural concrete applications, promoting resource conservation and waste reduction in sustainable construction practices.

100 Investigation of structural and electrical properties of Lead-free Potassium Bismuth Titanate piezoelectric ceramics

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In this paper Lead-free Potassium Bismuth Titanate (KBT) ceramic was successfully synthesized using the conventional sol-gel method. The structural analysis was carried out using X-ray diffraction (XRD),

9 789334 117967

stable crystal structure was formed having perovskite tetragonal phase. Electrical properties and dielectric measurements were studied at room temperature. I-V characteristics demonstrated an increase in leakage current with rising voltage, eventually showing ohmic behaviour at higher voltage ranges, suggesting a linear relationship between current and voltage in this region. These findings indicate that KBT has potential as an alternative to lead-based materials. It shows promise for use in energy storage and electronic applications.

101 Action of derivations on Lie ideals of Additively Inverse Semirings

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In this paper, the action of derivations on Lie ideals of semirings is examined by using commutator identities. Moreover, Posner's commutativity theorem is extended for prime additively inverse semiring S, when derivation d is centralizing on a Lie ideal L of S.

102 Solid-State Electrolytes and their Impact on the Future of Green Energy Technologies

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Solid-state electrolytes (SSEs) are becoming crucial in the advancement of lithium-ion batteries (LIBs), providing improved safety, higher energy density and extended lifespan while aiding the global move toward sustainable energy and green technologies. This paper examines the properties, benefits and challenges of different types of SSEs: ceramics, polymers and composites. Ceramic electrolytes including oxides, sulfides, and phosphates, offer high ionic conductivity and thermal stability but encounter issues such as brittleness and interfacial complications. Polymer electrolytes, particularly solid and gel types are flexible and easy to manufacture, though their ionic conductivity at room temperature remains a challenge. Composite electrolytes which combine ceramics and polymers aim to enhance both mechanical strength and ionic transport. By promoting the transition to solid-state LIBs, these materials are driving the development of sustainable energy storage systems that support renewable energy sources like solar and wind. This analysis underscores the significant role of SSEs in advancing lithium-ion battery technology and paving the way for more sustainable and efficient energy solutions.

9 789334 117967

103 Sustainable Snow Cover Mapping in Himachal Pradesh: Integrating Machine Learning and Spectral Indices for Environmental Monitoring

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Accurate snow cover mapping is vital for sustainable water resource management and reducing the risk of natural disasters in the fragile Himalayan ecosystem. In this study, we harnessed machine learning techniques to improve snow cover detection in Himachal Pradesh using Sentinel-2 satellite imagery, processed through the Google Earth Engine platform. We calculated three spectral indices Normalized Difference Snow Index (NDSI), Normalized Difference Forest Snow Index (NDFSI), and Normalized Difference Water Index (NDWI) to differentiate snow, vegetation, and water bodies. A snow mask was generated using established thresholds, aimed at improving environmental monitoring. Several machine learning models, including Classification and Regression Tree (CART), Random Forest (RF), Support Vector Machine (SVM), and Gradient Tree Boosting (GTB), were trained on labeled snow and non-snow data to assess their effectiveness. The models were evaluated using key accuracy metrics such as overall accuracy, producer's and consumer's accuracy, and kappa coefficients. CART and Random Forest achieved the highest validation accuracy of 99.34% and a kappa value of 66.37%, demonstrating reliable performance across snow classifications, proving superior to traditional snow indices like NDSI and NDFSI, particularly in complex terrains. By integrating spectral indices with machine learning, this study offers a more reliable and scalable approach for snow cover monitoring, which is critical for maintaining the sustainability of water resources and enhancing disaster preparedness in the Himalayan region. The findings directly contribute to achieving Sustainable Development Goal (SDG) 6 (Clean Water and Sanitation) by improving the management of freshwater resources and SDG 13 (Climate Action) by supporting climate resilience in high-altitude ecosystems.

104 A Review and Synthesis of 0.8 (Ba0.70Ca0.30TiO3)-0.2Bi (Mg0.5Ti0.5) O3 (BCT-BMT) Relaxor Ferroelectric Ceramics

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The growing demand for pulsed power systems and miniaturized energy-autonomous systems (MEASs) requires a material that exhibits high energy and power density, high charging and discharging speed, and good temperature stability for the realization of advanced energy storage devices. Energy storage devices such as fossil fuels, batteries, and supercapacitors exhibit the highest

9 789334 117967

energy density. However, dielectric capacitors offer high power density and ultrafast charging and discharging speeds, making them promising candidates for high-power electronic systems. In addition, the low energy density of dielectric capacitors limits their practical applications. The keys to high energy density are a high dielectric constant, a slim hysteresis loop, and high electric breakdown strength. Lead-based ceramics exhibit high energy density but are undesirable due to their toxicity to the environment. Recently, lead-free relaxor ferroelectrics (RFEs) have emerged as appropriate candidates for pulsed power applications and MEASs. In this context, BaTiO3-based RFEs with BiMeO3 have attracted considerable attention due to their high energy density. Herein, a binary lead-free system 0.8(Ba0.70Ca0.30TiO3)-0.2Bi (Mg0.5Ti0.5) O3 (BCT-BMT) was synthesized using the sol-gel method. The X-ray pattern shows the tetragonal phase for the BCT-BMT sample calcined at 1100 °C for 4 h. This work suggests that the BCT-BMT is an attractive dielectric ceramic for applications of flexible energy storage.

105 Review on Improved Photocatalytic Performance of g-CN through Nonmetal Doping: Environment Remediation oriented sustainable approach

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Abstract: With the rise in population and rapid technological advancements, the demand for energy is increasing, contributing to significant environmental pollution. This review focuses on addressing water pollution challenges from various sources, particularly the discharge of waste chemicals, such as dyes, from industries like paints, textiles, and pharmaceuticals into natural water bodies. Semiconductor materials with wide band gaps have shown great potential in treating water pollution efficiently through photocatalysis. In this study, we explore the use of solar energy via graphitic carbon nitride (g-CN), a metal-free semiconductor, for the degradation of organic dyes. g-CN stands out due to its non-metal framework, chemical robustness, thermal resilience, suitable bandgap, environmental compatibility, and cost-effectiveness. However, it has limitations such as low surface area, limited charge mobility, and reduced light absorption, which hinder its overall photocatalytic performance. To address these drawbacks, non-metal doping with elements like carbon (C), sulfur (S), oxygen (O), phosphorus (P), and nitrogen (N) has been employed. These non-metal dopants enhance the photocatalytic efficiency of g-CN by improving charge transport, increasing the lifetime of charge carriers, and broadening light absorption in the visible spectrum. This approach significantly improves the photocatalytic performance of g-CN, making it more efficient for green energy applications like water splitting, CO_2 reduction, and pollutant degradation. By focusing on non-metal doped g-CN, this review presents an innovative, sustainable strategy for environmental remediation, offering solutions for the development of green energy technologies in a more efficient and environmentally friendly manner.

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106 Exploiting Statistical Information Value (SIV) approach for Landslide hazard zonation of a Western Himalayan region

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Landslide events in Western Himalayan regions, especially in Himachal Pradesh, increase in the monsoon season. Increased frequency of these events causes threats to human population, and huge damages to the infrastructure as well. The aim of the current study was to generate a Landslide hazard map of Chandra-Bhaga basin, Himachal Pradesh, India, using Statistical Information Value (SIV) approach. 1137 landslide points, screened from previous reports concerning historical landslide events, were chosen for establishing a landslide inventory. The inventory was randomly divided into training and testing datasets, comprising of 70% and 30% data, respectively. This was done using ArcGIS v.10.8.4 software. Ten landslide influencing parameters, including aspect, elevation, slope, rainfall, LULC, distance from road, lineament density, soil types, geomorphology, and plan curvature, were selected for Landslide hazard zonation. Next, the training dataset was taken to create a landslide vulnerability map by SIV approach. The map was further divided into five categories, i.e., very high, high, moderate, low, and very low, by the natural break method. Lastly, the testing dataset was incorporated for validating the zonation map. Accuracy of the mapping was predicted by Area under the Receiver Operating Characteristic curve (AUC-ROC). The results showed that AUC obtained from SIV approach displayed a high accuracy of 86.2%. The appreciable prediction value supported the landslide vulnerability map generated using SIV approach. SIV hence appeared as a feasible strategy for mitigating landslide events in the study region. The study also serves as an important piece of research for decision-makers and land-use planners.

107 A Review on Na0.5Bi0.5TiO3 (NBT) and (1-x) NBT-xSrTiO3 (NBT-ST) Relaxor Ferroelectric Ceramics

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The increasing demand for clean and efficient energy necessitates research on advanced energy storage applications such as pulsed power applications and miniaturized energy autonomous systems. Presently, the bulk of materials are electronic devices made of lead. Nevertheless, the usage of lead raises environmental issues, which is what motivates the creation of substitute ferroelectric materials

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free of lead. In this context, lead-free dielectric materials are a potential alternative due to their high energy storage density, low energy loss, and thermal stability as compared to other energy storage devices such as batteries and electrochemical capacitors. The sodium bismuth titanate (Na0.5Bi0.5TiO3) NBT relaxor ferroelectric material being eco-friendly can be employed as energy storage dielectric material. High temperature stability, high Curie temperature, high relative dielectric constant (εr), and strong spontaneous polarization are among the benefits of NBT-based ceramics. Pure NBT ceramic's low breakdown strength Eb and substantial remnant polarization Pr lead to a low energy storage density, which restricts its applicability. To obtain good energy storage density values by lowering Pr and raising Eb, A-site modification can be considered. (1-x) NBT-xSrTiO3 ceramics might be a promising material for energy storage applications.

108 Optimized Multi-Component Attention Graph Convolutional Neural Network with FAResNet for Cardiovascular Disease Prediction in Rheumatoid Arthritis Patients

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Globally, cardiovascular disease (CVD) is the primary cause of silent and non-communicable deaths. It is essential to diagnose cardiac disease early and accurately. There is a need of a method to identify CVD in patients with rheumatoid arthritis before it progresses. In this work, Optimized Multi-Component Attention Graph Convolutional Neural Network with FAResNet for Cardiovascular Disease Prediction in Rheumatoid Arthritis Patients (MAGCNN-FAResNet-CVDP) is proposed. The input data gathered are pre-processed using Un-sharp Structure Guided Filtering (USGF) for balancing the risk classes. Then, Wader Hunt Optimization Algorithm (WHOA) is used for selecting relevant features from the pre-processed data. The relevant Features are fed to a Multi-Component Attention Graph Convolutional Neural Network (MAGCNN) with Feature Affine Residual Network (FAResNet) for Cardiovascular Disease Prediction. In general, MAGCNN-FAResNet does not include optimization strategies for determining optimal parameters for CVD prediction. Therefore, this paper further proposes the Leaf in Wind Optimization (LWO) to maximize the variables of the proposed method and is implemented and analysed with the support of performance metrics comprised of Accuracy, Receiver operating Characteristics (RoC) and the Computation time. The Performance of the MAGCNN-FAResNet-CVDP approach is a reliable machine intelligence method for precise recognition of cardiovascular disorder utilizing ensemble method (RMIM-CVD-EL).

9 789334 117967

109 Guar gum based quaternized adsorbent for the effective removal of anionic dyes

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Polymer analogous reactions introduce additional functional groups to the backbone of polysaccharide, making it more polar and hydrophilic. This enhances the material's adsorption selectivity for the targeted pollutant and improves its capacity to adsorb polar adsorbates. Considering this viewpoint, guar gum (GG), a galactomannon polysaccharide with plenty of hydroxyl groups, has been modified in an effort to remove anionic dyes from wastewater. The modification of GG was done by its reaction with amine, yielding qauternized guar gum (Q-GG) as the end product. The synthesized Q-GG was characterized by different methodology, such as FTIR, surface charge analysis, XRD, FESEM, and EDS. After the analysis of results from the characterization, Q-GG was explored as an adsorbent for the removal of anionic dyes from wastewater. Following initial testing with various anionic dyes, Q-GG demonstrated the best adsorption for Congo red (CR) with adsorption capacity of 48.08 mgg-1 (96.16% removal) at pH 6.0, 30^{o}C in 25 min and for methyl orange (MO) with adsorption capacity of 49.01 mgg-1 (98.02% removal) at pH 6.0, 30^{o}C in 30 min. Various non-linear kinetic models, such as pseudo-first order, pseudo-second order, and Elovich and non-linear isotherm models, such as: Langmuir, Freundlich, and Temkin were applied to understand the mechanistic pathway of the adsorption process. The graphic data reflected the better fitting of pseudo second order model and Langmuir isotherm model for CR and pseudo-first order model and Langmuir isotherm for MO. Furthermore, Q-GG's reusability testing showed strong adsorption for up to nine cycles of adsorption- desorption. The reported bio-based adsorbent, Q-GG has thus tremendous potential as an economical, environmentally friendly, sustainable and efficient adsorbent for the removal of anionic dyes from wastewater.

112 Pine needles modified with thiosemicarbazide for the removal of harmful metal ion and cationic dye from wastewater

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In the present work, whole pine needles (PNs), a waste lignocellulosic biomass have been utilized to develop an effective adsorbent for methylene blue (MB), and mercury metal ion (Hg2+) by green and innovative methods. The PNs were oxidized and further treated with thiosemicarbazide (TSC) to obtain the adsorbent, oxidized pine needles modified with thiosemicarbazide (OPN-TSC). The as-obtained adsorbent was characterized by Fourier transform infrared spectrophotometry, X-ray diffraction, Field

9 789334 117967

emission scanning electron microscopy, energy-dispersive X-ray spectroscopy, and surface charge analysis. OPN-TSC was investigated as an adsorbent for removing cationic moieties, MB, and Hg2+ from their sample solutions. The values of %removal for MB and Hg2+ ions were 87.36% and 98.2%, respectively. Out of various kinetic and isotherms models applied, the adsorption data fitted well with pseudo-second-order kinetic and Freundlich isotherm for MB removal. In contrast, for Hg2+ ions removal, the data fitted well with Elovich and Langmuir isotherm. The parameters, namely Gibbs free energy and entropy changes revealed spontaneous and endothermic adsorption. OPN-TSC exhibited significant recyclability up to ten cycles for both the adsorbates. The studies established OPN-TSC as a cost-effective, biodegradable, and environmentally benign adsorbent for both the adsorbates.

113 Recent glacier area changes in the Ravi Basin: A study on the drivers and consequences of glacial retreat

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Glaciers are so prone to global warming and climatic variation. The present work focuses on Ravi basin glaciers which is a part of the Western Himalaya. The Ravi basin consists of 285 glaciers with areas ranging between 0.02 km2 and 8.0 km2. These glaciers were monitored for frontal changes from 2011-2020, using high to medium satellite resolution i.e., Landsat TM/ETM + / OLI PAN or Google Earth Pro satellite resolution data. Results showed that the total glacier area of the Ravi Basin was found reducing from 102.00 km² to 68.92 km². This reduction was mainly attributed to regional climatic variation. Moreover, this reduction can also be attributed to the increasing solar insolation and orientation toward the Southwest Himalaya, which are mainly debris-covered areas. Further field validation and continuous monitoring of the glacier basin are required to scrutinize the health of the glacier.

114 Photocatalytic valorization of cellulose using DES -TiO2 complex based nano-catalyst

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Photocatalytic conversion of cellulose into green fuels and organic chemicals has been recognized as most imperative approach in the field of biomass and bioenergy research. The development of photocatalysis for cellulose photo-reforming is essential for effective conversion. However, cellulose is

9 789334 117967

highly stable; it is quite difficult to convert it into a fuel or different important chemical products. Current exploration elucidates the effectivity of green deep eutectic solvent (DES) based TiO2 nano photo-catalyst towards cellulose transformation into valuable products. Photocatalytic conversion of cellulose has been performed in UV-light photochemical reactor using green catalyst. The effect of process parameters (reaction time, catalyst dose, and cellulose concentration) was studied for examining the effectual cellulose conversion. The instrumental analysis (XRD, FTIR, and NMR) of developed green catalyst and products has been conducted. Process for converting cellulose into useful compounds has been carried out using DES impregnated 1-butanol solvent based TiO2 photocatalyst. The present technique has the potential to be an effective strategy for transforming cellulose into valuable compounds.

115 Environmental survey of a cinchona plantation village situated in the Eastern Himalayas, India: Sustainable development perspectives

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The Eastern Himalayas in India have diverse ecological features in its varied range of flora and fauna. The local communities also form an integral part of the ecological landscapes, deriving various services from the forest and mountain ecosystems. Many scattered hamlets are found in these areas, and some are proximate to the forests enriched with endemic biodiversity. Wholesale (27o1'59" N, 88o51'45"E) is a small village situated in Kalimpong district, India and is proximate to Neora Valley National Park and Gorumara National Park. The village is one of the newest tourist destinations in the Eastern Himalayas. Wholesale village has extensive coverage of Cinchona plantation and is a part of Dalagaon division of Rongo cinchona plantation in West Bengal, established in 1938. A detail survey of the village was conducted to explore the socio-environmental and socio-ecological dynamics of the landscape. Structured questionnaires and semi-structured interviews supplemented by field notes were arranged to collect data from the village. There was particular focus on agriculture, livestock management, traditional water management, waste management, disaster management, biodiversity and ecosystem services. Biodiversity of the region was documented by visiting the forest areas in Neora Valley National Park and Gorumara National Park; possible threats to biodiversity were documented. Coexistence of ecotourism and conservation measures can have significant impact on the sustainable development in the transboundary Himalayan landscapes. Sustainable management strategies were suggested for conservation of forest biodiversity and socio-economic development of the village areas. Detailed study is needed in the Eastern Himalayan villages to explore the social, economic, and environmental perspectives in the backdrop of climate change.

9 789334 117967

116 Leveraging Influencer Marketing For New Age Employment: Opportunities in the Digital Era

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The emergence of influencer marketing has changed the face of traditional marketing and opened up new job opportunities in a number of industries. This essay investigates the relationship between influencer marketing and employment, looking at how this digital marketing tactic promotes brand engagement while simultaneously creating a sizable number of jobs in the digital economy. The growing dependence of businesses on social media platforms has led to a need for a variety of roles, such as data analysts, influencer managers, digital strategists, and content developers, as influencers may help firms reach their target audiences more efficiently. This study explores the roles and competencies that are emerging in the influencer marketing space through an analysis of relevant literature and case studies from the industry, underscoring the changing nature of the digital marketing professional's job market. Additionally, it looks at how influencer marketing affects gig workers and freelancers, providing adaptable employment options in brand collaboration, video production, and content creation. The article also discusses obstacles and offers solutions for them, including the competitive influencer market, employment insecurity, and regulatory concerns. In the end, this study highlights how influencer marketing has the potential to be a major factor in driving employment in the digital era and offers predictions for the nature of labor in a marketing ecosystem that is changing quickly.

118 Spirulina for Potential Healthcare Applications

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Spirulina, a blue-green microalga, has garnered attention for its potential healthcare applications due to its rich nutritional profile and bioactive compounds. Research indicates that Spirulina may offer various health benefits, particularly in antioxidant, anti-inflammatory, and neuroprotective capacities. Spirulina is composed of 50-70% protein, essential amino acids, vitamins (notably B12 and β-carotene), and minerals like iron. Spirulina is rich in vitamins A, C, E, and B and essential minerals like calcium, zinc, and magnesium. It contains bioactive components such as phycocyanin, which has shown potential in inhibiting NADPH oxidase, suggesting roles in inflammation and oxidative stress management. Studies indicate that Spirulina may enhance brain health by reducing mental fatigue and protecting vascular integrity, potentially mitigating cerebrovascular conditions. Spirulina is abundant in antioxidants such as phycocyanin and beta-carotene, which combat oxidative stress. Spirulina supplementation has been linked to improvements in cognitive and motor skills in malnourished children. Spirulina enhances gut

9 789334 117967

microbiota diversity, reduces inflammation, and improves metabolic health. It exhibits immunomodulating and anti-inflammatory properties, beneficial for various diseases. Clinical evidence supports Spirulina's safety, with no serious health risks reported. Its immunomodulatory and antiviral properties further enhance its therapeutic potential. While Spirulina shows promise in various health applications, individual dietary needs and potential allergies must be considered. Further research is needed to fully understand its long-term effects and optimal usage.

119 Nanomaterials-Enhanced Herbal Medicine: A Novel Approach for Improved Therapeutic Diagnosis and Efficacy

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The combination of nanomaterials and herbal medicine has been identified as a better strategy to enhance the healing capabilities of age-old treatments. This new approach of combination is using traditional herbal medicines with nanomaterials which are biocompatible like Zinc, TiO2, and PLGA for better formulation and stability of therapeutic medicines. Thus better absorption of the herbal medicines are encapsulated in nanomaterials for healing purpose. In these formulations herbal compounds are encapsulated in synthesized nanostructures which supports in transportation and delivery of herbal load at target site. These formulations have edge on existing drug delivery carrier in terms of various pharmaceutical parameters. Studies have shown the benefits and advantages of using these platforms in terms nano layering herbal medicines to treat patients has unique advantages medicine system as Enhanced bioavailability (25-50% increase), improved pharmacokinetics (30-50% reduction in clearance rates), augmented therapeutic effects (20-40% increase in antioxidant and anti-inflammatory activity), reduced cytotoxicity (15-30% decrease) However, some of the bothersome issues remain, such as poor absorption and cyto-toxicity.

120 Greening Healthcare: Sustainable Materials for Environmental

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The healthcare sector has an ecological footprint necessitates innovative approaches to sustainability, emphasizing incorporating environment-friendly products that safeguard both the environment and human health. When it comes to green evaluation of the materials in consideration for use in this field of healthcare, this review attempts to show how the materials might probably help reduce waste, emissions, and resource utilization. In the presence of some substitutes like bioplastics, natural fibers, recycled content, bio-based composites, advanced natural polymers, the healthcare sector is able to be environmentally sustainable while providing a high standard of care to the patients. There is a need for sustainable strategies because of the healthcare sector's relatively large carbon footprint, especially in the case of using eco materials to aids in the minimization of waste, gas emissions and depletion of available resources. Essential sustainable materials that can change the existing processes in the healthcare system are presented in this review, including bioplastics, natural fibers, recyclable materials,

9 789334 117967

and bio-based composites. Furthermore, naturally occurring polymers such as alginate, polycaprolactone (PCL), and chitosan provide biodegradable alternatives for medical devices, some synthetic materials such as polylactide (PLA) Polyhydroxy butyrate (PHB), Polyhydroxy alkanoate (PHA), polyglycolic acid(PGA) for tissue engineering, and wound care. It will reduce greenhouse gas emissions (20-40%), minimize medical waste (30-50%), lower toxic chemical release (15-30%), and conserve water resources (10-20%). By integrating these sustainable materials, the healthcare industry can significantly reduce its environmental impact while maintaining high standards of care.

121 Revolutionizing Agriculture: The Impact of Machine Learning and Deep Learning

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DL and ML are revolutionizing agriculture by emphasizing innovation to address resource scarcity, food insecurity, and climate change. ML models enable precision alignment in water, herbicides, and fertilizer applications in precision agriculture by taking into account the spatial heterogeneity of the farms. This will increase crop yields utilizing resources intensively. Moreover, real-time bits of knowledge into soil quality and supplement levels are provided by sensor-based soil health monitoring and data analytics. Disease Location: - Image recognition algorithms have revolutionized the detection of plant diseases. Imagery taken by a drone or handheld device can now be used by farmers to identify diseases at an early stage. With DL-powered early warning systems, farmers can predict outbreaks based on historical data and environmental factors to take preventive measures in time and reduce losses in crops. It is also being applied to predict crop trim yields by exploring strange relationships between earlier agrarian information, climate designs, and the conditions of soil. This can make all the difference to the farmer in planning and managing hazard for tasks like planting, gathering, and asset allocation by making it possible to predict their yields much more accurately.
Independent farming systems such as planting, weeding and harvesting are revolutionized by Artificial intelligence and machine vision. It functions with precision, efficiency, and saves labor cost with increased yields. Further, ML advances agricultural supply chain management through enhanced forecast demand, inventory control. Actually, it is ML and DL-based integration in agriculture that is adding fuel to efficiency, supportability, and global food security, related to determination of demand, stock management, and transportation coordination, acquiring an economical behavior and reducing waste quantity.

9 789334 117967

122 Assessing the Ecological Effects of Hydropower Dams on Diatom Communities in the Sutlej River

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River regulation, through the construction of dams and hydropower projects, has significant ecological consequences on aquatic ecosystems, particularly on diatoms. Diatoms, a major group of microalgae, serve as sensitive bioindicators of water quality and ecosystem health due to their responsiveness to environmental changes. This study assesses the impact of water regulation on diatom communities along various sections of the Sutlej River, located in the Kinnaur district of Himachal Pradesh, India. The focus is on the effects of two major hydropower projects, Karchham-Wangtu and Nathpa Jhakri, with a combined capacity of 2,500 megawatts, which have drastically altered the river's flow regime. The research examines diatom diversity, species composition, and distribution in three distinct zones: upstream, within the reservoir, and downstream. Results indicate that hydrological alterations due to dam have caused profound changes in water temperature, sediment transport, and nutrient availability-key factors that regulate diatom communities. Species adapted to high-flow conditions have been displaced by those favoring more stable, low-flow environments. This shift has led to a notable decline in diatom diversity, with specific taxa becoming dominant at the expense of others, resulting in homogenization of diatom communities. This loss of biodiversity has broader ecological implications, potentially disrupting food webs and reducing ecosystem services and nutrient cycling. The study emphasizes the importance of adopting integrated water resource management strategies that balance hydropower development with preserving ecological integrity. Mitigating the adverse impacts of river regulation on diatom communities is essential for maintaining biodiversity and ensuring the long-term sustainability of river ecosystems like the Sutlej.

123 From Synthesis to Application: The Role of Nanomaterials, Soft Materials, and Biomaterials in Medical Health Care

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Nanomaterials, soft materials, and biomaterials are increasingly vital in advancing medical healthcare, due to their distinctive physical, chemical, and biological properties. These materials have significantly extended the range of medical applications, from diagnostic tools and drug delivery systems to tissue engineering and regenerative medicine. This review examines various synthesis techniques and the unique properties of nanomaterials, including top-down and bottom-up approaches that allow for precise control over particle size, shape, and surface functionality. Soft materials like hydrogels and polymers are especially notable for their flexibility and biocompatibility, enabling them to simulate biological tissues and serve roles in wound healing and controlled drug delivery. Biomaterials, both natural and synthetic, are engineered to interact seamlessly with biological systems, making them ideal

9 789334 117967

for use in prosthetics, implants, and cellular scaffolds. The essential role of these materials plays an important role in innovative healthcare solutions, with a focus on personalized medicine, targeted therapies, and minimally invasive procedures. By contrasting traditional and green synthesis techniques, the review emphasizes the increasing movement toward sustainable production. This comprehensive exploration not only showcases recent progress in nanotechnology and biomaterial sciences but also looks at future opportunities for incorporating these materials into clinical settings. Taking a multi-disciplinary perspective, this article offers insights into how nanomaterials, soft materials, and biomaterials have the potential to transform patient care and drive advancements in medical healthcare.

125 A Review of Recent Advances in Sustainable Environmental Practices for Road Junction Design and Management

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The rapid growth of urbanization and vehicular traffic has placed significant stress on road junctions, making them critical points of environmental concern. This review paper examines recent advances in sustainable practices aimed at enhancing the environmental performance of road junctions. The study explores innovations in junction design, material selection, and traffic management strategies that reduce pollution, minimize energy consumption, and enhance biodiversity. Furthermore, it delves into the integration of green infrastructure, such as permeable pavements and vegetation, and the use of smart technologies for real-time traffic optimization. By synthesizing the latest research and case studies, this paper provides a comprehensive overview of how sustainable practices can be effectively applied to road junctions, contributing to the broader goal of sustainable urban development. The findings underscore the importance of multidisciplinary approaches in achieving environmental sustainability at these critical nodes of transportation networks.

126 Phytoremediation Strategies: A Pathway to Soil Decontamination and Environmental Health

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Rapid urbanization, emission from industries, automobiles, waste disposal, agricultural inputs are the major causes for hazardous effect on the water, air, land etc. However, heavy metal contamination from the landfills, mining, pesticides, fertilizers, degraded the soil quality which enters the food chain and thereby severely affecting the human health. Thus, choosing a green technology for reducing the ill effects of the contaminants in soil is important. Phytoremediation is the growing technology for

9 789334 117967

reducing heavy metal and toxic chemicals is cost effective, non-intrusive and eco-friendly. The selection of plants for reducing the effect of contaminants from the land without challenging food security is necessary. The metal binding proteins of plant are important in phytoremediation which includes metal activated enzymes, carrier proteins, metal storage proteins, metallothioneins etc. More than 400 species of plants are known which can significantly reduce the metal contamination form the soil and water. Thus selection of plant and role of plant protein for remediating the contamination is thus helpful in tackling problem and genetically modified plants can also be used for reducing contamination.

127 Sustainability Assessment of Sewage Treatment Plants in Northern India

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The current research focuses on evaluating the performance of seventeen full-scale sewage treatment plants (STPs) with capacities ranging from 3 to 182 MLD and operating on various technologies. Conventional activated sludge process (ASP), biofilm process (MBBR), biological nutrient removal process (MBR, A/O, and SBR), chemical process (DENSADEG), natural process (WSP), and anaerobic process (UASB) were among the technologies evaluated. In terms of BOD, COD, TSS, NH4-N, TN, and TP, removal efficiency of STPs was determined to be 69-98 percent, 73-97 percent, 70-98 percent, 55-96 percent, 54-90 percent, and 36-92 percent, respectively. Treatment results revealed that MBR-based STPs achieved the greatest removal in all aspects whereas UASB with FPU-based STPs achieved appreciable removal in terms of BOD, COD, and TSS, respectively. The average land utilization of each kind of STP was calculated to be 995 m2/MLD, except for the waste stabilization pond (WSP) which required the most area of all plants, i.e., 15000 m2/MLD. The average capital cost to install the evaluated STPs was estimated to be 39 US$/inhab. It was also observed that the operation & maintenance (O&M) cost of all the selected STPs ranged from 0.27 to 3 US$/inhab/year, while the average O&M cost was 1.24 US$/inhab/year. The study reveals that specific power consumption varied between 0 and 0.76 kW/m3 for each type of plant except WSP and UASB as they do not need electricity. The cost of treatment was in the range of 0.003 to 0.34 US$/m3. The results showed that the actual integrated efficiency (IE) of most of the evaluated STPs were greater than standard IE or very close to standard value except for WSP and UASB. Current study will help the stakeholder for decision-making scenario while selecting a sustainable solution for wastewater treatment.

128 Advanced Applications of Soft Biomaterials in Clinical Biomedical Engineering

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The introduction of soft biomaterials in biomedical engineering is driving significant advances in the design and functionality of medical devices and therapeutic strategies. These materials, including hydrogels, biocompatible polymers, and biodegradable scaffolds, offer unique properties such as flexibility, adaptability, and biocompatibility that remain essential for bridging the gap between laboratory science and clinical application. Soft materials are mainly valuable for their ability to mimic the mechanical properties of biological tissues, making them ideal for tissue engineering, wound healing, and the development of wearable medical devices. Recent innovations in biomaterials have led to the development of smart, stimuli-responsive materials that allow for precise control of drug delivery and enhanced interaction with biological systems. Additionally, bioelectronics using soft conductive materials is transforming the field of personalized healthcare by enabling the creation of advanced wearable sensors and neural interfaces. These technological breakthroughs enable more effective, patient-specific treatments and improve therapeutic outcomes. The role of soft biomaterials in bridging the gap between research and clinical application, emphasizing their potential to enhance the effectiveness of medical devices and provide advanced therapeutic solutions across various healthcare sectors.

129 Powering the Future: Simulation of Standalone Photo-Voltaic Systems with Droop Control

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When a DC microgrid is functioning in island mode, the DC-DC converters help transport energy from the photovoltaic panels to the load in the microgrid. The parallel coupled inputs in islanded mode resulted in nonlinear imbalanced circumstances and grid overload. The most popular method, the droop control technique, is employed to guarantee efficient power sharing because it is not currently in place. The inability to share power at the maximum power point is a drawback of this. In this work, we do this using the MPPT method, in which the power is perturbed and observed at each occurrence using the P&O algorithm.

130 Effect of religious vibrations on properties of water

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Water pattern and vibrations are affected by the environmental conditions. Present book chapter analyses the effect of religious vibrations on physical properties of water. In the present case, water was collected from different religious places and was compared with the water available at our home. Physical parameters studied were pH, Total Dissolved solids (TDS) and electrical conductivity (EC). Results showed that the water collected from the religious places were perfectly lying in the standard data of water during the collection and also after storage of water according to International and National standards, whereas the water collected from the houses and offices had a variation. The results showed that holy vibration from religious places have a positive effect on water.

131 Automated Smart Petrol Pump Based on IoT

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A platform named"Smart Petrol Pump" was developed to improve the ease and speed of refilling at gas stations. This system seamlessly integrates with gas pump operations, allowing customers to select their pump, type of fuel, and amount before arriving at the station. On arrival, customers can start the refilling process by scanning the QR code on the pump. Once the transaction is automatically authorized through the platform, the requested fuel quantity is dispensed into their vehicle. Furthermore, the Smart Petrol Pump platform provides customers with access to discounts, promotions, and real-time fuel prices at participating stations, enabling them to track their fuel costs.

132 Evaluation of Aspergillus fumigatus for degradation of Resorcinol

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Resorcinol, a common phenolic compound, is associated with many industries like, dye, resins and rubber industries. It has often been linked to serious water pollution issues, on its discharge into industrial effluents generated. Reports suggest that exposure to resorcinol may lead to health hazards and thus, ways to remove resorcinol from industrial effluents is important. The primary objective of the given investigation was to evaluate Aspergillus fumigatus NTCC1222 for degradation of resorcinol under liquid state fermentation. The best degradation was observed on 8th day of incubation at pH 8 and an incubation temperature of 37oC with 2 g/L concentration of resorcinol as carbon source. The current study provides a preliminary background to further evaluate and characterize Aspergillus

9 789334 117967

fumigatus NTCC1222 for its ability to possibly mitigate resorcinol pollution. This would add to the search for environment compatible solution to removal of related to phenol derivative pollution.

133 Diabetic Foot Ulcer: Current Scenario and Future Strategies

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Diabetes mellitus is a chronic medical condition globally, having abundant complications including stroke, renal failure, vision loss, amputation, diabetic neuropathy, and peripheral and coronary artery diseases. People with diabetes often develop non-healing wounds called diabetic foot ulcers (DFUs), particularly in the lower limbs. The prevalence of diabetic foot ulcers ranges between 15 and 25% among diabetic patients, with about 85% of these cases resulting in amputation. The DFUs have a complex and intricate pathogenesis, including factors like foot deformities, poor blood circulation, peripheral neuropathy, peripheral artery disease (PAD), trauma, limited joint mobility, and abnormal foot pressure. Conventional dressings have inadequate efficacy in treating DFUs, which results in deprived wound healing. An optimal wound dressing should provide a moist environment, control wound exudate, prevent opportunistic infections, and promote tissue regeneration. Nonetheless, existing dressings do not completely meet these needs for DFU treatment. Therefore, there is a compelling demand for novel, economically feasible, and more efficacious remedies to address the challenges posed by diabetic foot ulcers. It is also crucial to assess the payload of bioactive compounds that have tissue-regenerating, intrinsic antioxidant, and anti-inflammatory properties. Nanofibrous scaffolds made of biocompatible biomaterials mimic the extracellular matrix, which allows cell adhesion, migration, and proliferation. Nanofibrous scaffolds have several advantages over traditional dressings for treating diabetic foot ulcers due to their high area-to-volume ratio. Their porous structure allows oxygen and nutrient exchange while maintaining a moist environment. Various dressings are being developed for treating diabetic foot ulcers; however, further research needs to be done.

135 Experimental Investigation of Machining Performance of Micro Groove Textured High Speed Steel Tools During Turning of SS 316 L under Dry Environment Conditions

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This research investigates the machining performance of micro-groove textured high-speed steel (HSS) tools during the turning of SS 316L under dry conditions. Surface texturing on cutting tools is a promising approach to enhance cutting performance by reducing friction and wear. In this study, micro-grooves were created on HSS tools, and their performance was evaluated in terms of cutting force, surface roughness, tool wear, and temperature rise during the dry turning of stainless steel 316L (SS 316L). The present study is conducted to determine the machining performance of a micro-groove-textured high-speed steel (HSS) tool during the turning of austenitic stainless steel (SS) 316 L in a dry environment. Dry turning experiments are conducted at a combination of varied parameters such as cutting speed, feed, and depth of cut based on the Taguchi L9 orthogonal array. A detailed study was conducted on chip morphology and chip compression ratio to understand the effect of machining parameters on the micro-textured HSS tool's performance. The optimum levels of these machining parameters were selected based on the S/N (signal-to-noise) ratio. It has been found that cutting speed is the most influential parameter on textured tool performance. It is suggested machining parameters for turning SS 316L with a micro-groove-textured tool at moderate cutting speed, feed, and high depth of cut. The results demonstrate that the micro-groove texture significantly improves tool life and reduces cutting forces compared to non-textured tools, making it a potential solution for sustainable and high-performance machining.

137 Harnessing the Potential of Thermoelectric for Daily life

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This article examines the transformative potential of thermoelectric devices in harnessing thermal energy for sustainable energy solutions. As the demand for energy efficiency and reduced carbon footprints escalates, thermoelectric technology emerges as a promising method for converting waste heat from industrial and household processes into usable electrical energy. The integration of these devices could revolutionize energy management practices, particularly in automotive and industrial applications, enhancing energy recovery systems. Furthermore, advancements in materials science and nanostructures are set to improve the efficiency of thermoelectric generators, optimizing energy recovery and minimizing losses. This exploration underscores the implications of thermoelectric devices for future energy sustainability, advocating for their widespread adoption as a standard practice across various sectors, thereby contributing to a more energy-efficient and environmentally conscious society.

138 Optimization of Fused Deposition Modelling Process Parameters by Using a Grey Fuzzy Logic Technique

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This paper presents the optimization of process parameters for multi-response characteristics of Fused Deposition Modelling (FDM) using Grey Fuzzy Relational Analysis (GFRA) on PETG material. The study focuses on minimizing dimensional error while maximizing tensile strength and ductility in the FDM process. The process parameters considered include layer thickness (Lt), build orientation (Bo), fill density (Fd), and fill pattern (Fp), which are investigated using the Taguchi L9 orthogonal array. The goal is to achieve an optimal balance between minimal dimensional error and maximum tensile strength and ductility. By analyzing the response characteristics with Grey Relational Grade (GRG) and Grey Fuzzy Relational Grade (GFRG), the best combination of input parameters is identified. Analysis of variance (ANOVA) reveals that Bo and Fd are the most significant factors influencing the mechanical properties.

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- Frontiers of Knowledge
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- Young Researcher (Female & Male)
- Life Time achievement
- Best Academician/Teacher/Mentor
- Best Leadership

Nominations are open for the Best and Young Researcher Award. The award in this category is based on the following parameters:

- ✓ Scopus Citations
- ✓ Google Citations
- ✓ H and i10 Index
- ✓ Number of Research papers published/accepted in the year (2024 - 2025)
- ✓ Funded projects/Patents (filed/published/granted)/ Consultancy

The list of previous awardees is available at https://stemrs.in/awardee.php
For more details, please visit: https://stemrs.in/awards.php

The 3rd Science, Technology, Engineering, and Management (STEM) Award Ceremony will be held at Himachal Pradesh University, Shimla, in November 23, 2024. This prestigious event celebrates the remarkable achievements of professionals in various fields, acknowledging their contributions to research, academia, and leadership. Awards are distributed across multiple categories for both male and female recipients. The Young Researcher Award recognized emerging talents making significant strides in their fields. The Best Academician Award honored outstanding educators for their dedication and impact on students and the academic community. The Best Leadership Award celebrated exceptional leaders driving progress and innovation. The Excellence in Research Award was given to individuals who have demonstrated groundbreaking research and significant contributions to their disciplines. Lastly, the Best Researcher Award acknowledged those with a consistent track record of high-quality, impactful research. The ceremony highlighted the STEM - Research Society's commitment to fostering excellence and innovation across science, technology, engineering, and management disciplines.

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