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ST. JOSEPH COLLEGE
OF ARTS AND SCIENCE FOR WOMEN

(Affiliated to Periyar University, Salem)
Pagalpatty, Omalur (Tk), Salem (Dt) - 636 304
sjc2021slm@gmail.com www.sjcsalem.edu.in
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CONFERENCE PROCEEDING

3rd One Day International Conference on
ADVANCED MATERIAL SCIENCE & NANOTECHNOLOGY (ICMSN-2024)

Date : 25.09.2024

Organized by

Department of Physics &
Indian Association for Crystal Growth

Chennai - 603110, Tamil Nadu, India

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Tamil Nadu, India

Department of Physics

&

Indian Association for Crystal Growth

Chennai-603110 ,Tamil Nadu, India

Jointly Organize

3rd One Day International Conference on

"ADVANCED MATERIAL SCIENCE & NANOTECHNOLOGY" (ICMSN-2024)

25.09.2024 | 9.00 AM | GONZAGA AUDITORIUM

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PRESIDENT MESSAGE

Mother G. Rajamani

"Nanotechnology has the potential to solve some of humanity's greatest challenges."

Dear Esteemed Participants,

I am delighted to extend my warmest congratulations to all attendees of the International Conference on Material Science and Nanotechnology. This gathering represents a remarkable opportunity for scholars, researchers, and industry experts to come together and explore the latest advancements in these dynamic fields.

As we delve into discussions and share our findings, I encourage each of you to embrace the spirit of collaboration and innovation. The insights gained here will undoubtedly contribute to the ongoing evolution of material science and nanotechnology, paving the way for future breakthroughs.

Wishing you all a successful and inspiring conference!

Warm regards,

Mother G. Rajamani
President

SECRETARY MESSAGE

Sr. Dr. A Antony Maria Jansi

"Materials science is the key to unlocking sustainable technologies."

Dear Esteemed Guests, Researchers, and Participants,

I extend my warmest congratulations to our Principal and Head of the Department of Physics, Dr. A. Ameer Baig, for his tireless efforts in organizing the International Conference on Material Science and Nanotechnology. His dedication and leadership have made this event a resounding success.

I also wish to express my gratitude to all the authors who have contributed their research papers to the conference proceedings. Your work enriches our understanding of material science and nanotechnology, and we are honored to showcase your findings.

As we gather to share knowledge and ideas, I wish you all a productive and enlightening conference. May the discussions and collaborations sparked here lead to groundbreaking innovations and discoveries.

Thank you, and I wish the conference all the best!

Sincerely,
Sr. Dr. A M Jansi FSAG
Secretary

ADMINISTRATOR MESSAGE

Rev. Sr. T. Reetha Marry FSAG

It is with great pleasure that I welcome you to the International Conference on ***Advanced Material Science and Nanotechnology***, hosted by department of Physics .We are excited to bring together leading researchers, industry experts, and students from around the globe to share knowledge and foster collaboration.

This conference offers a unique platform to explore the latest advancements, research breakthroughs, and applications in material science and nanotechnology. I encourage you to actively participate in the sessions, engage with the speakers, and network with fellow attendees. I appreciate the HOD , convener and organizing committee for this excellent work in conducting the conference.

Thank you for being part of this important event. Together, we can advance the frontiers of material science and nanotechnology.

Best regards,
Sr. Reeta FSAG
Administrator

PRINCIPAL & CONVENER-ICMSN-2024

Dr.A.Ameer Baig

Dear Distinguished Guests, Researchers, and Participants,

I am delighted to welcome you to the International Conference on Material Science and Nanotechnology, hosted by the Department of Physics.

This conference aims to provide a platform for experts from around the world to share their knowledge and research in the fields of material science and nanotechnology. We have an exciting lineup of keynote speakers, technical sessions, and paper presentations that will showcase the latest advancements and innovations in these fields.

I congratulate the organizing committee for their tireless efforts in making this conference a reality. I also appreciate the support of our faculty members, students, and staff in making this event successful.

I wish you all a productive and enriching experience at the conference. May this conference foster new collaboration, inspire new ideas, and contribute to the advancement of material science and nanotechnology.

Best regards,

Dr. A. Ameer Baig,
Principal
Convener-ICMSN

KEYNOTES ADDRESS

Dr. A. Dhayal Raj
Associate Professor & Head (Research),
PG & Research Department of Physics,
Sacred Heart College (Autonomous), Tirupattur 635 601.

Importance of Nanotechnology in Research

Nanotechnology, the science and engineering of manipulating matter at the atomic and molecular scale, has become a transformative force in research across various scientific disciplines. Its significance lies not only in its potential to revolutionize existing technologies but also in its capacity to open up entirely new avenues of exploration and discovery. At its core, nanotechnology involves the ability to work with materials at the nanoscale typically between 1 and 100 nanometres. This scale is crucial because materials often exhibit unique properties at this size, such as enhanced strength, lighter weight, or improved electrical and thermal conductivity. By harnessing these properties, researchers can develop advanced materials with unprecedented capabilities. For instance, nanomaterials like carbon nanotubes and quantum dots have demonstrated remarkable mechanical strength and optical properties, respectively, making them invaluable in fields ranging from materials science to electronics.

In medicine, nanotechnology offers ground breaking potential. Researchers are developing nanocarriers for targeted drug delivery, which can significantly improve the efficacy of treatments while minimizing side effects. These carriers can be engineered to release drugs at specific sites in the body, ensuring that therapeutic agents are delivered precisely where needed. Additionally, nanotechnology facilitates the creation of highly sensitive

diagnostic tools, enabling early detection of diseases such as cancer through enhanced imaging techniques and biomarkers. In electronics, nanotechnology drives the miniaturization of components and the enhancement of performance. Innovations such as nanoscale transistors and memory devices are pivotal for advancing computing power and energy efficiency. As devices become smaller and more efficient, they pave the way for the development of smarter, more versatile technologies.

The environmental impact of nanotechnology is also a critical area of research. Nanomaterials can be employed to create more efficient catalytic converters that reduce harmful emissions, or to develop advanced filtration systems for purifying water and air. These applications not only address pressing environmental issues but also contribute to sustainable development by minimizing resource consumption and waste production. Furthermore, nanotechnology plays a vital role in fundamental research by enabling scientists to observe and manipulate matter at an unprecedented level of detail. Techniques like scanning tunneling microscopy and atomic force microscopy, which rely on nanotechnology, allow researchers to study the properties of materials at the atomic scale, leading to new insights into fundamental physical and chemical processes.

In summary, nanotechnology stands at the forefront of scientific research, offering transformative potential across a wide range of applications. Its ability to manipulate matter at the nanoscale leads to innovative solutions in medicine, environmental protection, electronics, and fundamental science. As research continues to advance in this field, it promises to unlock even more possibilities, driving progress and addressing some of the most pressing challenges facing society today.

ABOUT COLLEGE

St. Joseph College of Arts and Science for Women (Affiliated to the Periyar University, Salem), Pagalpatty, Omalur TK, Salem Dt. - 636304, TamilNadu is a Catholic Minority Institute, established in 2021, managed by Franciscan Sisters of St. Aloysius Gonzaga, Pondicherry. It is a women-religious congregation committed to the integral human development. The members of the congregation have been rendering their dedicatedservice in the fields of education, health care, and social welfare both in national and international spheres since 1775. The mission of the college is toeducate the rural and marginalized sections of women and to transform themselves and society in Equality, Justice, and Peace. Presently the College offers B.A. English, B.Com (C.A), B.Sc. Computer Science, B.Sc. Physics, B.Sc. Mathematics, B.Com, BCA, B.A. History, M. com, and M.Sc Computer Science along with employable professional skill based development courses.

ABOUT DEPARTMENT

The department of Physics mainly aims to make students acquire enhanced computational and analytical skills and the scientific temperament to focus on the pursuit of Innovative application of knowledge to benefit society. The department offers undergraduate programme with practically focused multi-dimensional quality learning experience in an excellent academic environment. The main objective is to stimulate the minds and hearts of the rural students' relentless curiosity and dynamic involvement in Physics. A well-equipped and spacious lab is provided to inspire students to explore creatively hypotheses through experimentation. The department always ahead in performing the various academic activities.

ABOUT ICMSN- 2024

Material Science and Nanotechnology play an important role in the technological development of a society .The continuous demand for more advanced and sophisticated applications is closely linked to the availability of innovative materials. Nonlinear media play a major role in many of the optical applications such as optical signal processing, optical computers, ultrafast switches, ultra-short pulsed lasers, sensors, laser amplifiers. Nanotechnologies including Medical Fields, Electronics / Semiconductor Industry, Manufacturing Industries Biotechnology, Pharmaceuticals and Environmental, etc. This conference intends to cover areas like fundamentals and technologies for every day in nanotechnology applied to medicine and dentistry will bring significant advances in the diagnosis, treatment, and prevention of disease, biomedicine and other sectors. This conference will highlight experimental and theoretical breakthroughs in the design/ implementation of such materials and devices. Research and innovations are critical to satisfy these pressing needs. This conference will offer a timely opportunity to stimulate new research activities in technological and managerial advancement. Eminent academic researchers, industrials practitioners, green groups and governmental department from different sectors in the local and international contacts will gather to share scientific and technical inputs through active discussion.

Organizing Committee

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Rev. Mother G. Rajamani FSAG
President

Sr. Dr. A. Antony Maria Jansi FSAG
Secretary

Patrons

Rev. Sr. T. Reetha Mary FSAG
Administrator

Dr. A. Ameer Baig , Principal,
Head ,Department of physics & Convener

Co-Convener

Mrs. S. Yoganandhini Assistant Professor / Physics

Conference Co-ordinators

Mrs.A. Deepa Assistant Professor / Physics

Ms. K. Indhumathi Assistant Professor / Physics

Ms. Padmapriya Assistant Professor / Chemistry

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17. Dr. D. Sakthi, Principal,E.R.K college, Harur.
18. Dr.A. Christy ferdinand, Periyar Arts College, Cuddalore

Eminent Speakers

Dr. Ariharan Arjunan
Postdoctoral Research Fellow
School of Applied Science
University of South Wales, United Kingdom
Topic: Hydrogen Storage Possibilities on Carbon Nanomaterial

Dr. N. Vijayan
Principal Scientist & Head
Indian Reference Materials (IRM) Division
CSIR-National Physical Laboratory, New Delhi
Topic : Importance of Accurate and precise measurements in advanced research

Dr. Muthu Senthil Pandian
Research Scientist, Senior Grade-III
Photovoltaic Devices Laboratory
SSN Research Centre, Department of Physics
SSN Institutions, Chennai, Tamil Nadu
Topic : Development of Device Quality Technology Important NLO Single Crystals

Rev. Fr. Dr. S. Xavier,
Controller of Examinations & HOD of Physics,
St. Joseph's College of Arts &Science(Autonomous)
Cuddalore.
Topic : Sunlight-activated dye degradation of metal oxide decorated graphene oxide

Keynote Address

Dr. A. Dhayal Raj
Associate Professor & Head (Research),
PG & Research Department of Physics,
Sacred Heart College (Autonomous),
Tirupattur

Address for Communication

Dr. A. AMEER BAIG, Convener, ICMSN - 2024
Principal, Head, Department of Physics
St.Joseph College of Arts & Science for Women
Pagalpatty, Omalur Tk, Salem Dt - 636 304
Cell : +91 94867 87172
Email ID : stjosephicmsn2024@gmail.com
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Tamil Nadu, India

Department of Physics
&
Indian Association for Crystal Growth

Chennai-603110, Tamil Nadu, India

Jointly Organize

Cordially invite you for the

3rd One Day International Conference on

ADVANCED MATERIAL SCIENCE & NANOTECHNOLOGY (ICMSN-2024)

25.09.2024 | 9.00 am | Gonzaga Auditorium

About the College

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Call for Papers

Original papers are invited from academicians, research scholars and industrialists in the following areas and any related topics:

- Advanced Materials Science
- Crystal Growth & Applications
- Nanomaterials, Technology & Applications
- Supercapacitors and Batteries
- Nonlinear Optical (NLO) Materials
- Medical Physics
- Quantum Dot and Applications
- Solar Cell Applications
- Thermoelectric Materials & Applications
- Biosensor, Environmental and Wastewater treatment, Photocatalytic

Call for Abstracts

Abstracts of your valuable research work paper as per the conference theme are invited from both online and offline mode. The abstract must be restricted to 300 – 500 words in the MS word format with 12 font size from Times New Roman style pattern. Send your paper through the official mail id provided in this invitation. Certificate will be provided to all registered participants. Best paper presentation will be honored and awarded.

Important Dates

Last Date for Abstract Submission	: 06.09.2024
Last Date for Registration	: 10.09.2024
Acceptance of Notification	: 13.09.2024
Last Date for Full Paper submission	: 18.09.2024

Registration

The following departments could participate and present papers at the conference:

1. Chemistry
2. Biochemistry
3. Microbiology
4. Biotechnology
5. Botany
6. Zoology

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General Instructions

- **ISBN:** Abstracts will be published in the conference proceedings with ISBN.
- **ISSN:** Full-length articles will be published in the online journals with ISSN for an additional charge.
- All rights of publication of paper included in the conference shall rest with the conference organizers.

Crossref Google

- Conference Kit, Lunch & Certificate will be provided for the registered participants.
- No **T.A. / D.A.** will be provided.
- Spot Registration will also be accepted.

ST. JOSEPH COLLEGE OF ARTS & SCIENCE FOR WOMEN

(Affiliated to Periyar University)

Pagalpatty, Omalur (Taluk) Salem District – 636 304, Tamilnadu, India

Department of Physics

3rd One Day International Conference On

"Advanced Material Science & Nanotechnology" (ICMSN – 2024)

Programme Schedule

Date: 25 September 2024 **Venue**: Gonzaga Auditorium

Inauguration:	**9.00 am – 10.30 am**

Welcome Address:	**Dr.A.Ameer Baig, Principal** Convener (ICMSN-2024), HOD, Department of Physics, St. Joseph College of Arts & Science for Women, Pagalpatty Salem – 636 304, Tamilnadu.
Presidential Address:	**Rev. Sr. Dr. A. Antony Maria Jansi**, **Secretary** St. Joseph College of Arts & Science for Women, Pagalpatty Salem – 636 304, Tamilnadu.
Felicitation:	**Rev. Sr. T. Reetha Mary , Administrator** HOD, Department of English, St. Joseph College of Arts & Science for Women , Pagalpatty. Salem-636304, Tamilnadu.
Keynote Address:	**Dr.A.Dhayal Raj,** Associate Professor &Head (Research), PG & Research Department of Physics, Sacred Heart College (Autonomous), Tirupattur.

Technical Session – I **10.30 am – 11.15 am**

Introducing the Speaker : **Mrs.S.Yoganandhini,**

Assistant Professor, Department of Physics,

St. Joseph College of Arts & Science for Women, Pagalpatty

Salem – 636 304, Tamilnadu.

Resource Person : **Dr.A.Dhayal Raj,**

Associate Professor &Head (Research),

PG & Research Department of Physics,

Sacred Heart College (Autonomous),

Tirupattur.

Tea Break **11.15 am – 11.30 am**

Technical Session – II **11.30 am – 12.15 pm**

Introducing the Speaker : **Ms.K.Indhumathi,**

Assistant Professor, Department of Physics,

St. Joseph College of Arts & Science for Women, Pagalpatty

Salem – 636 304, Tamilnadu

Resource Person: **Dr. N.Vijayan,**

Principal Scientist & Head

Indian Reference Materials (BND) Division

CSIR-National Physical Laboratory, New Delhi

Oral Presentation **12.15 pm – 12.45 pm**

Technical Session – III **12.45 am – 1.30 pm**

Introducing the Speaker : **Ms.M.J.Padmapriya,**
Assistant Professor, Department of Chemistry
St. Joseph College of Arts & Science for Women, Pagalpatty
Salem – 636 304, Tamilnadu

Resource Person: **Rev. Fr. Dr. S. Xavier,**
Controller of Examinations & HOD of Physics,
St. Joseph's College of Arts &Science(Autonomous)
Cuddalore.

Lunch Break **1.30 pm – 2.00 pm**

Technical Session – IV **2.00 pm – 2.45 pm**

Introducing the Speaker : **Ms.K.Indhumathi,**
Assistant Professor, Department of Physics
St. Joseph College of Arts & Science for Women, Pagalpatty
Salem – 636 304, Tamilnadu

Resource Person: **Dr. Ariharan Arjunan,**
Postdoctoral Research Fellow
School of Applied Science
University of South Wales, United Kingdom

Technical Session – V **2.45 pm – 3.30 pm**

Introducing the Speaker : **Mrs.S.Yoganandhini,**
Assistant Professor, Department of Physics,
St. Joseph College of Arts & Science for Women, Pagalpatty
Salem – 636 304, Tamilnadu

Resource Person: **Dr. Muthu Senthil Pandian**

Research Scientist, Senior Grade-III

Photovoltaic Devices Laboratory

SSN Research Centre, Department of Physics

SSN Institutions, Chennai, Tamil Nadu.

Oral Presentation **3.30 pm – 4.00 pm**

Valedictory Session **4.00 pm – 4.15 pm**

Vote of Thanks **4.15 pm**

Miss. N.Kamalavarshini,

II- Bsc Physics ,

Department of Physics,

St. Joseph College of Arts & Science for Women, Pagalpatty

Salem – 636 304, Tamilnadu

RESOURECE PERSON

Dr. Ariharan Arjunan

Hydrogen Storage Possibilities on Carbon Nanomaterials

Abstract

Hydrogen is one of the cleanest energies with potential to have zero carbon emission. Hydrogen storage is a challenging phase for the hydrogen energy application. Hydrogen would be ideal as a synthetic fuel because it is lightweight, highly abundant and its oxidation product (water) is environmentally benign, but storage remains a problem. Hydrogen storage is a materials science challenge because, for all six storage methods currently being investigated, materials with either a strong interaction with hydrogen or without any reaction are needed. Besides conventional storage methods, i.e. high pressure gas cylinders and liquid hydrogen, the physisorption of hydrogen on materials with a high specific surface area, hydrogen intercalation in metals and complex hydrides, and storage of hydrogen based on metals and water are reviewed. Here we present recent developments in the search for innovative materials with high hydrogen-storage capacity. The pyrolysis and hydrogen absorption conditions of the hydrogen storage materials have been summarized, especially the improvements of the hydrogen storage materials. Furthermore, the challenges of the hydrogen storage materials have been pointed out.

Keywords: Hydrogen storage, Adsorption, Surface area, Porosity, Carbon materials,

RESOURCE PERSON

Dr.N.Vijayan

Importance of accurate and precise measurements in advanced research

Dr.N. Vijayan

CSIR-National Physical Laboratory, Dr KS Krishnan Marg, New Delhi – 110 012.

E mail: nvijayan@nplindia.org

Abstract:

Accurate and precise measurements are the cornerstone of advanced research, enabling scientists to generate reliable data that drives innovation and discovery. In disciplines like physics, materials science, engineering, and biology, even minor deviations in measurements can lead to significant errors, misinterpretations, or faulty conclusions. Accurate data underpins reproducibility, a key element of scientific integrity, ensuring that experiments can be verified and validated across different laboratories and by other researchers globally. In industries like aerospace, healthcare, and environmental science, precision in measurements is directly linked to safety, health, and sustainability. For example, in medical diagnostics, highly accurate measurements can mean the difference between early disease detection and missed opportunities for treatment. Similarly, in environmental monitoring, precision helps scientists track and predict changes in climate, pollution, or biodiversity, contributing to policy-making and sustainable practices. Moreover, accurate measurements are essential for developing new technologies and enhancing existing ones. In material science, precise data enables the creation of advanced materials with specific properties for electronics, energy storage, or aerospace applications. In research focused on metrology, where the goal is to define and refine units of measurement, accuracy ensures consistency in measurements worldwide, facilitating international trade, innovation, and collaboration. In CSIR-NPL, we are developing Indian Reference Materials (BNDs) for the calibration of various equipment's such as PXRD, SEM, FTIR, UV-Vis., etc. The detailed informations will be shared to the audience during the conference.

RESOURCE PERSON

Dr. Muthu Senthil Pandian

Development of Device Quality Technologically Important
Nonlinear Optical (NLO) Single Crystals for Practical Applications

Muthu Senthil Pandian*, P. Ramasamy

Photovoltaic Devices Laboratory, SSN Research Centre, Department of Physics,
SSN Institutions (Autonomous), Chennai-603110, Tamil Nadu

*E-mail: senthilpandianm@ssn.edu.in

Abstract

Gravity driven concentration gradient is used in the uniaxially solution-crystallization method of Sankaranarayanan-Ramasamy (SR). TGS, GPI, KAP, SSDH, DGZCD, DGBCM, benzophenone and many more crystals have been successfully grown by SR method. Longest benzophenone crystal having dimension of 1350 mm length and 55 mm diameter was grown for the first time in solution growth by SR method. Starting with a thin plate as seed a large size crystal can be grown. The physical properties and crystalline perfection of the SR method grown crystal is normally superior to the conventional method grown crystals. The quality of the SR method grown crystals has been improved by several modifications made in SR method. The impurity segregation cannot be avoided in the existing SR method. So we planned to introduce the RSR method for growing good quality, unidirectional single crystals. The effect of rotation on unidirectional crystal growth method (Rotational Sankaranarayanan - Ramasamy (RSR)) has been proposed for the first time. The organic nonlinear optical 2-Aminopyridinium 4-nitrophenolate 4-nitrophenol (2APNP) crystals have been grown by (i) conventional slow evaporation, (ii) Sankaranarayanan-Ramasamy (SR) method and Rotational SR (RSR) method. The grown 2APNP crystals were subjected to various

studies like HRXRD, laser damage threshold, chemical etching, Vickers microhardness, birefringence, UV-Vis NIR, dielectrics and piezoelectrics. The Rotational Sankaranarayanan-Ramasamy (RSR) method grown crystals show excellent optical, mechanical, dielectric and piezoelectric behavior and higher laser damage threshold capability compared to the conventional and normal SR method grown crystals. HRXRD and etching studies showed that the quality of the RSR method grown crystal is better than conventional and normal SR method grown crystal. The Rotational Sankaranarayanan-Ramasamy (RSR) method can be used to grow single crystals along a specific crystallographic direction such as the phase matching direction in nonlinear optical (NLO) crystals. The unidirectional crystal growth method is ideally suited for crystal growth along this direction to obtain large size crystals required for obtaining SHG elements with minimum wastage. In addition, the unidirectional solution crystallization usually occurs at around room temperature; much lower thermal stress is expected in these crystals over those grown at high temperatures. Successful development of this unidirectional method will provide the technology to produce crystals at a yield close to 100% and easy scaling-up process.

2AP4N grown by (a) Conventional method, (b) SR method and (c) RSR method

References

[1] X. Luo, S. Pan, X. Fan, J. Wang and G. Liu, *J. Cryst. Growth*, **2009**, **311,** 3517-3521.

[2] T. Kamalesh, P. Karuppasamy, Muthu Senthil Pandian, P. Ramasamy, *Chi. J. Phy.* **2022**, 76, 68-78.

RESOURCE PERSON

Rev.Fr. Dr. S.Xavier

Sunlight-activated dye degradation of Metal Oxide decorated GO

Dr. S. Xavier[a]

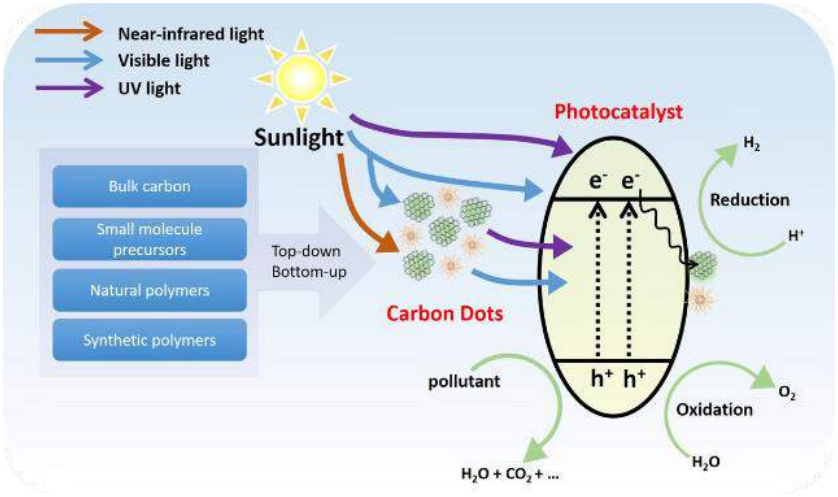
[a]St. Joseph's College of Arts & Science (Autonomous), Cuddalore-607001.

puduvaixavier@gmail.com

Abstract

The aim of the work is to synthesize transition metal oxides and alkaline earth metals with graphene oxide, which was characterized using HR-TEM, UV-Vis, FT-IR, and P-XRD analysis. The thoroughness of the research process, from synthesis to characterization, instills confidence in the results. Due to its unique properties, transitions metals and alkaline earth metals have been shortlisted to decorate the graphene oxide. The material was analysed by various techniques to evaluate its structure, band gap, and functional groups. Water is considered one of the most valuable and endangered in the current situation. Many pollutants, sulfates, candies, and other heavy metals were injected into the river sides, which caused water pollution. Considering these issues, the material was tested for its photocatalytic ability. The synthesized materials were tested against pollutants to determine their degradation ability. The photodegradation was performed against p-nitrophenol and Levofloxacin. The photodegradation was initiated at different catalyst dosages (10 mg, 30 mg, and 50 mg). The best dosage that degrades the pollutants was evaluated, and the active metal oxide was also identified. The studies deal with whether rare earth metals influence degradation efficiency. The band gap of the material, pH of the solution, active species, and the metal oxide may influence the photodegradation efficiency. In addition, theoretical calculations were also performed to evaluate the experimental infirmity. Comparing the experimental results, we see that both materials significantly impact the pollutants, suggesting a potential solution to water pollution.

Keywords: Graphene oxide, photodegradation, adsorption, energy-gap, pollutants.


Near-infrared light
Visible light
UV light
Sunlight
Photocatalyst
Bulk carbon
Small molecule precursors
Natural polymers
Synthetic polymers
Top-down
Bottom-up
Carbon Dots
e⁻ e⁻
h⁺ h⁺
H₂
Reduction
H⁺
pollutant
H₂O + CO₂ + ...
Oxidation
O₂
H₂O

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AP01

Synthesis Of Vanadium Oxide Nanostructures In Supercritical Carbon Dioxide Using Sol-Gel Chemistry And Outstanding Thermo Chromic Characteristics

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ABSTRACT

A straight forward supercritical CO2 (scCO2) sol-gel method was used to study the synthesis of vanadium oxide (VO2(M) utilizing acetic acid as a catalyst and vanadium(V) oxytriisopropoxide (VTIP) as the vanadium precursor. The produced sol-gels' chemical contents were studied by FTIR and their morphology by SEM, respectively, after scCO2 was heated to 40, 60, 80, and 100 °C under 41.4 MPa. Aerogel with lower nanofiber size was created at 41.4 MPa and 80 °C. By analyzing the XPS and XRD spectra of the produced vanadium oxides, the calcination conditions were investigated with respect to various atmospheres, time durations, and aerogel shapes. The best calcination results, with V(IV) of 49.5%, V(V) of 47.1%, and V(III) of 3.4%, were obtained by calcining vanadium oxides aerogel cast on glass substrate in N2 at 500 °C for 15 minutes.

Keywords: SEM, Vanadium (V), XPS, Vanadium oxide, XRD.

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AP02

Preparation and characterization of bioactive silica derived from Rice Husk supported TiO_2 and cobalt nano composite via sol – gel route.

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ABSTRACT

In the present study, amorphous silica nano particles were taken from low cost rice husk by carrying out acid treatment by the process of heat treatment. Silicon precursor was obtained in the form of sodium silicate rice husk ash. Sodium silicate solution was obtained by direct silica extraction from rice husk via solvent extraction method without adding any template. The target nano composite ($RHS/TiO_2/CO$) was formed by embedding the cobalt nano particles into SiO_2/TiO_2. The prepared samples were characterized by XRD, FTIR, SEM/EDS, TG-DTA, UV and TEM. The cobalt was found to isomorphously substitute in the silica matrix. A good dispersion of cobalt nano particles was evidenced by X- ray diffraction. Scanning electron microscopy confirms the formation of well dispersed and spherical cobalt nano particles. During TGA analysis, it was observed that, mass trace suddenly goes backwards along the abscissa and then continues forward normally. This technique provided an environmentally friendly production process for conversion of waste rice husk to high performance materials.

Keywords: Rice husk, Amorphous silica, Nano particles, SiO_2/TiO_2.

AP03

Solvation model, Spectroscopic Analysis, Non-Covalent interactions and Molecular docking investigations of 2-(2-Bromo-acetylamino)-5-chloro-benzophenone

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Abstracts

2-(2-Bromo-acetylamino)-5-chloro-benzophenone (2B5CB) compound were synthesized and characterized by SC-XRD, FT-IR, UV–Vis, ^{1}H–^{13}C NMR and analyzed with experimental data. The DFT approach with the B3LYP functional and 6-311++G (d,p) basis set was used to calculate the geometry parameters and wavenumbers of the title compound. Electronic absorption spectra and ^{1}H–^{13}C NMR studies have been computed in gas and solvents (dimethylsulfoxide, chloroform, and H_2O) by using the TD-DFT and the IEFPCM solvation model. The HOMO-LUMO energy band gap has also been determined. To identify the electron localization density and weak interactions, the Multiwin-3.8 was subjected to a topological analysis and non-covalent interactions, including ELF, LOL, DORI and ED. Studies of donor–acceptor connections were performed using NBO analysis. To calculate contributions to the molecular orbitals, TDOS was determined. Molecular electrostatic potential (MEP) reveals the chemical reactivity sites for the reaction. The stability of the title compound has been investigated via molecular dynamics simulations (MDS). In-vitro analysis was done with two fungal pathogens, such as *Aspergillus niger* and *Staphylococcus aureus*. Similarly, the NLO activity of the studied compound was highlighted by computing the first hyperpolarizability in different available solvents that have shown better activity than the standard drug (Ciprofloxacin). Finally, molecular docking and pharmacokinetics have been agreed upon to understand the binding energy of the ligand–protein interaction.

Keywords: Chemical reactivity, FT-IR, UV–Vis and NMR, Topological analysis and Non-Covalent interactions, Molecular Dynamics Simulations, Antimicrobial activity.

AP04

Structural, optical, dielectric, and magnetic properties of Er_2O_3/MgO nanocomposite

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Abstract

Erbium tri oxide and magnesium oxide nanocomposite were effectively synthesized in the form of crystalline powder using a microwave irradiation approach. Various techniques were employed for identifying crystalline structure, FTIR fingerprint region, fluorescence emission behaviors, and surface morphology, dielectric, and magnetic properties using PXRD, FTIR spectroscopy technique, fluorescence spectroscopic technique, SEM analysis, frequency vs. dielectric constant, and MH curve analysis, respectively. Confirmation of the metal-oxygen bond such as Er_2O_3, and Mg-O was established through the analysis of stretching frequencies in the FT-IR spectrum. The PXRD results using rietveld refinement confirmed the crystalline nature of the synthesized nanoparticles, consisting of Er_2O_3, and MgO with unit cell compositions 94.12 and 5.88 %, respectively. SEM imaging provided insights into the morphology of the particles, revealing a spherical shape with noticeable agglomeration. The elemental compositions such as Erbium (Er) and Oxygen (O), were validated by the EDS spectrum, confirming the successful achievement of Er_2O_3, and MgO nanoparticle in the synthesized composite. In addition, the Vibrating Sample Magnetometer (VSM) graph illustrated the paramagnetic behavior of the doped Er_2O_3/MgO composite at room temperature. The thorough examination of the synthesized Er-MgO NPs, covering structural, morphological, and magnetic characteristics, contributes to a comprehensive understanding of their properties.

Keywords: Erbium trioxide nanoparticles, Fluorescence emission, Dielectric property, FTIR spectrum.

AP05

L-asparagine monohydrate doped magnesium sulphate heptahydrate semiorganic crystals: growth, structural, thermal, and optical properties

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Abstract

Using the slow evaporation method, a new semi-organic crystal was produced by doping the organic chemical L-asparagine monohydrate (C4H8N2O3·H2O) with the inorganic substance magnesium sulphate heptahydrate (MgSO4·7H2O). The powder X-ray diffraction method was used to calculate the crystallographic characteristics, such as strain, dislocation density, and crystallite size. FT-IR spectroscopy was used to identify functional groups and calculate bond length and force constants. The crystal's component elements were determined via energy dispersive X-ray (EDX) analysis. By using thermogravimetric analysis (TGA) analysis, kinetic and thermodynamic parameters have been found, including activation energy Ea, change in Gibb's free energy (ΔG), and change in enthalpy (ΔH). While the change in entropy (ΔS) displays negative values, Ea, ΔH, and ΔG exhibit positive values. The crystals' behavior with regard to heat deterioration has been examined by differential scanning calorimetry analysis (DSC). From the UV–vis transmittance data, several optical constants were determined, including the optical band gap, lattice dielectric constant, absorbance, extinction coefficient, the ratio of the concentration of free charge carriers to the effective mass, Urbach energy, and the optical and electrical conductivities. The semi-organic crystal's excellent photoresponsiveness is explained by its high optical conductivity.

Keywords: MgSO47H2O L-asparagine Properties of structure Characterizing heat UV–Vis spectroscopy Energy of the optical band gap

AP06

SYNTHESIS AND PROPERTIES OF BIONANOCOMPOSITE - NANOCHITOSAN REINFORCED WITH MICROCRYSTALLINE CELLULOSE

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ABSTRACT

Bio-nanocomposites in different ratio were successfully developed using microcrystalline cellulose extracted from sisal fibers as the reinforcement and nanochitosan as the polymeric matrix. MCC was extracted by adopting steam explosion technique and nanochitosan was prepared using ionotropic gelation method. The effect of reinforcement on the structure, morphology and properties of the bio-nanocomposites were characterized by SEM, FTIR, TGA, DSC and swelling analysis. The results indicated that the bio- nanocomposites can be used as efficient materials for heavy metal removal in water treatment.

Keywords: Nanochitosan, MicroCrystallineCellulose, Bio-nanocomposite, Morphology, Structure and Properties.

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AP07

Structural and Dielectric Studies of Praseodymium Oxide

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Abstract

A highly crystalline Praseodymium Oxide (Pr_6O_{11}) was grown by alkaline assisted growth method. The Praseodymium nitrate was taken as precursor and placed in alkaline medium (KOH and NaOH) at atmospheric pressure and temperature of ~180°C. The observed Praseodymium hydroxide was then kept for annealing at 400°C to get Pr_6O_{11}. The structural studies of synthesized Pr_6O_{11} were carried out by X-Ray Diffraction and Transmission Electron Microscope. XRD analysis confirms that Pr_6O_{11} is highly crystalline. The dielectric studies were performed in the frequency range of 1 kHz-1MHz over the temperature range of 30-250 °C.

Keywords: Pr_6O_{11}, Synthesis, Dielectric Properties

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AP08

Preparation of Iron Oxide nanoparticles for Photocatalytic Application

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Abstract

Photocatalysis is one of the major areas of research in the current era as the need for purification of water has increased over time. Iron oxide nanoparticles (hematite) have been synthesized for Photocatalytic application through simple precipitation method and the obtained sample was calcinated at three different temperatures (400° C, 600°C, 800°C). The materials were characterized using powder X-ray diffraction (XRD), scanning electron microscopy (SEM), ultraviolet-visible spectroscopy, vibrating sample magnetometer (VSM), and Fourier transform infrared (FTIR) spectroscopy. The crystallite size were calculated and its shows when the calcination temperature increases, the crystallite size is also increased. The band gap energy was investigated by the UV-Vis absorption study and the presence hematite phase of α-Fe_2O_3 was confirmed by FTIR spectroscopy. The magnetic study confirmed that it's a Hematite phase of (α-Fe_2O_3). The average particle sizes were calculated and its shows the rod-like morphology. Finally, the photocatalytic efficiencies of the samples were calculated and presented.

Keywords: Hematite, Iron Oxide nanoparticles, Chemical precipitation method, Bandgap, Rod-like morphology, Photocatalytic efficiency.

AP09

Examining The Behaviour Of Bfo Nanoparticles Under Shockwave-Loading

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Abstract

This research investigates the nature of BFO nanoparticle synthesis hydrothermally and the synthesized samples were characterized through XRD, FTIR, SEM, and UV-visible spectral analysis. The samples were exposed to shockwaves to observe the changes in the properties of the synthesized samples and to study the effects of shockwaves loading. The XRD data indicates a high crystallite nature of samples and also phase transition occurred from rhombohedral structure to cubic structure due to shock wave loading. The average crystalline sizes calculated by the Debye-Scherrer method revealed a decrease in the crystallite size on exposure to shock waves. The pure sample displays uniform spherical morphology with less agglomeration and shock-induced samples were found to possess a porous structure as witnessed from SEM results. The FTIR specifies the stretching and bending vibration at different peak positions of BFO nanoparticles. The bandgaps for pure and shock-loaded nanoparticles were calculated from UV-visible absorption spectrum.

Keywords: BFO, hydrothermal, shock-loaded, phase transition, high crystallite nature, spherical morphology, bandgap.

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AP10

Synthesis and Characterization of MnFe 2 O 4 Nanoparticles for Enhanced and Catalytic Properties

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ABSTRACT

Manganese ferrite (MnFe 2 O 4) nanoparticles have been synthesized using a sol-gel method. Thestructural and morphological properties of the synthesized nanoparticles were characterizedusing X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), scanningelectron microscopy (SEM), transmission electron microscopy (TEM), and Brunauer-Emmett-Teller (BET) surface area analysis. The magnetic properties were evaluated using a vibratingsample magnetometer (VSM). XRD analysis confirmed the formation of the spinel structure ofMnFe 2 O 4 . FTIR spectra showed the characteristic absorption bands associated with the Mn-Oand Fe-O stretching vibrations. SEM and TEM images revealed the spherical morphology of thenanoparticles with an average size of 20-30 nm. The BET analysis indicated a high surface areaof 45 m^2/g. VSM measurements revealed a saturation magnetization of 65 emu/g and a coercivityof 30 Oe. The synthesized MnFe 2 O 4 nanoparticles exhibited excellent catalytic activity for the degradation of methylene blue dye under UV irradiation. The enhanced catalytic perfor mancecan be attributed to the high surface area and the presence of reactive oxygen species generated during the photocatalytic process.

Keywords: MnFe 2 O 4 nanoparticles, sol-gel synthesis, characterization, magnetic properties, catalytic activity, methylene blue degradation.

AP11

Cancer nanotechnology: Planetary Ball mill and Ultrasonication Mediated Unification of Resveratrol and MgO Nanoparticles and Synergistic Inhibition of Brest Cancer

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Abstract

Nanotechnology has been widely considered and subjugated for cancer therapy as nanoparticles can performance a noteworthy character as a drug transport system. Equated to predictable drugs, nanoparticle-based drug delivery has definite recompenses, such as enhanced stability and biocompatibility, boosted permeability and retention effect, and accurate targeting. Furthermore, scientists have newly ongoing to explore the protagonist of nanoparticles in immunotherapy, which theatres a more imperative protagonist in cancer treatment. In this paper, we deliberate the role of Resveratrol loaded MgO Nanoparticles against breast cancer. Solid, as well as nanosized Resveratrol and MgO nanoparticles were loading by mixing, then ball milled using planetary. The MgONPs loaded with resveratrol in 1:1 concentration taken in a conical flask and mixed in ethanol solution and Ultrasonication was made up to 30minutes the resulting nano solution used as a nanomedicine for breast cancer treatment. The resveratrol loaded MgONPs carriers were characterized by UV-Vis spectroscopy, XRD, TEM and FT-IR spectroscopy.Breast cancer epitomizes the second foremost cause of cancer death in females after lung cancer. Resveratrol loaded MgO nanoparticles plays a dynamic role in the inhibition and suppression of breast carcinogenesis. The florescence-labeled Resveratrol-MgONPs were co-cultured with the MDA-MB-231 human breast cancer cells for 12 h. As a result, Resveratrol-MgONPs were affected by the MDA-MB-231 cells and supplemented in the cell membranes. Both its antioxidant and anti-inflammatory chattels subsidize suggestively to persuading apoptosis and cell cycle seizure in the expansion of breast cancer. Regarding the off-target damage to normal cells and targeting cancer cells, emerging evidence demonstrated that a cell-nanoparticle-based drug delivery system could be a promising platform for tumor-targeted therapy due to its high drug-loading capacities and the inherent tumour-control capabilities.

Key words: ball mill, cancer, florescence, resveratrol, tumour.

AP12

Computational and vibrational spectroscopic conformation of Isobavachalcone by DFT method- A potent antimicrobial agent

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Abstract

Isobavachalcone, a naturally occurring chalcone, mainly demonstrates multiple pharmacological activities, including anti-cancer, anti-microbial, anti-inflammatory, antioxidative, neuroprotective, and among others. Owing to the significant gap in the knowledge and understanding of the mechanisms of antimicrobial action and the development of resistance, the optimization of antimicrobial therapies therefore becomes a necessity. It is on this note, that this study seeks to both experimentally and theoretically investigate the antimicrobial efficiency of Isobavachalcone. To accomplish this, the compound was analyzed using several spectroscopic approaches, such as UV, and FT-IR spectral studies. The computational calculations for the molecule were carried out using density functional theory (DFT) at the B3LYP/6-311G+(d,p) level of theory. The electronic absorption spectra were calculated using the time-dependent density functional theory (TDDFT) method. The difference between the observed and the scaled wavenumber values of most of the fundamental are small. The HOMO-LUMO energy gap reveals that the compound comes under the category of soft molecule. Intermolecular interactions were assessed using (3D-HS) and fingerprint plots. To understand the Pharmacokinetic behaviour of the molecule, a molecular docking study has been done.

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AP13

Synergetic effect of MgO-Chitosan-pluronic F-127 nanocomposites

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Abstract

In the present work, Magnesium oxide (MgO)-Chitosan-pluronic F-127 nanocomposites were prepared using a green process with Amomum subulatum Roxb extract. The synthesized nanocomposites were characterized by X-ray diffraction studies, dynamic light scattering, Fourier transform infra-red spectroscopy, UV-Vis spectroscopy, Photoluminescence spectroscopy and antibacterial studies.

Keywords : MgO-Chitosan-pluronic F-127 NPs; XRD;DLS; UV;PL; Antibacterial Activity

AP14

Nano-Forensics: Revolutionizing Crime Scene Investigation With Nanomaterials

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Abstract

Introduction of nano-forensics as a revolutionary method for crime scene analysis, the development of nanotechnology has opened up new forensic science avenues. This essay explores the use of nanomaterials, which have special qualities that greatly improve forensic evidence preservation, processing, and detection. With previously unheard-of precision, forensic investigators can now find minute quantities of DNA, poisonous compounds, and fingerprints by using nanoparticles, quantum dots, and other nanoscale materials. The article also looks at how nanotechnology is being used in forensic imaging to produce higher-resolution crime scene reconstructions than are possible with conventional techniques. Case studies and real-world applications demonstrate how nano-forensics has resolved complicated criminal cases, demonstrating its ability to completely transform the way that investigations are conducted. Adoption of these technologies is not without its difficulties, though, as there are technical restrictions and ethical issues to be carefully considered. The paper predicts upcoming developments in forensic science that will strengthen the application of nanotechnology to criminal investigation and represent a substantial advancement in the pursuit of justice.

Keywords: Nano-forensics, Nanomaterials in forensic science, Crime scene investigation, Forensic nanotechnology, Evidence detection and analysis

AP15

Nanomaterials As Game Changers In Forensic Toxicology And Trace Analysis

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Abstract

Nanomaterials have revolutionized forensic toxicology and trace analysis by significantly enhancing the precision and sensitivity of detection methods. Their special qualities, like their high surface area-to-volume ratio and remarkable reactivity, make it possible to identify minute concentrations of medications, biological materials, and poisons that conventional techniques could miss. This article demonstrates how nanoparticles can be used to identify narcotics, poisons, and other minute forensic evidence, enhancing the precision and efficiency of forensic investigations. Particular uses include nanoscale instruments and sensors based on nanoparticles, which let forensic experts find even the tiniest bits of evidence. As nanotechnology develops, further advances in forensic science could result from its integration, which could lead to more efficient solutions for challenging toxicology and trace analysis cases.

***Keywords*:** Nanomaterials, forensic toxicology, trace analysis, nanoparticle sensors, forensic evidence

AP16

Unraveling The Mysteries Of The Cosmos: The Role Of Astrophysics In Modern Science

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ABSTRACT

Astrophysics, a branch of space science that seeks to understand the physical properties and underlying laws governing celestial bodies, has significantly advanced our knowledge of the universe. Important astrophysical ideas are covered in this article, such as the creation and development of stars, galaxies, and black holes. It also explores the ongoing hunt for life beyond Earth, the discovery of exoplanets, and the detection of gravitational waves. In addition, the significance of dark matter and dark energy in the formation of the universe is discussed, along with the latest technological developments that are pushing the limits of astrophysics research. Through these subjects, the article demonstrates how astrophysics provides insights into the past, present, and future of the universe and aids in the unraveling of the deepest cosmic riddles.

***Keywords*:** Astrophysics, Stars, Galaxies, Black Holes, Exoplanets, Dark Matter

AP17

Enhanced Photocatalytic Activity of La_2O_3 Nanoparticles through Time-Dependent Hydrothermal Synthesis

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Abstract

In this study, lanthanum oxide (La_2O_3) nanoparticles were synthesized using the hydrothermal method, with varying reaction times of 6, 12, and 24 hours. The synthesized nanoparticles underwent a comprehensive set of characterization techniques, including X-ray diffraction (XRD), UV–Visible absorption spectroscopy (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), and Raman scattering analysis. XRD results indicated that the average crystallite sizes of La_2O_3 were in the range of 6 to 8 nm, with increased reaction times resulting in improved crystallinity. UV-Vis spectroscopy revealed a decrease in the bandgap energy as the reaction time increased, suggesting enhanced optical properties. SEM analysis showed that the synthesized La_2O_3 nanoparticles were agglomerated into spherical shapes, with particle sizes ranging from 35 to 86 nm. Photocatalytic performance was evaluated by the degradation of methylene blue dye under halogen light exposure. The La_2O_3 nanoparticles synthesized under optimized conditions demonstrated a high photocatalytic efficiency, achieving an 89% degradation rate. This study highlights the importance of optimizing hydrothermal synthesis parameters, particularly reaction time, to enhance the photocatalytic properties of La_2O_3 nanoparticles for potential environmental applications.

Keywords: La_2O_3, Hydrothermal method, Nanoparticles and photocatalytic efficiency.

AP18

Fabrication and Characterization of Z-type Dye-Sensitized Solar Modules forthe indoor photovoltaic applications

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Abstract

Dye-Sensitized Solar Cell (DSSC) technology is a photovoltaic technology that mimics natural photosynthesis, categorically coming under third generation photovoltaics. With nearly three decades of development, DSSCs have established a prominent position in the photovoltaic arena owing to its unique merits like roll-to-roll compatibility, cost-effective fabrication techniques using affordable and readily available materials, adaptability to flexible substrates, and higher power conversion efficiency under indoor or artificial lighting compared to conventional first and second generations of solar cells.This work builds an understanding on the DSSC technology from a module perspective, reviewing the progress in manufacturing technologies, outlining its evolution as a potential future candidate in photovoltaic sector and aims to optimize and evaluate the performance of Dye-Sensitized Modules (DSMs) under various indoor lighting conditions. DSMs having a size of 5×5 cm^2 and an active area of 13.44 cm^2 were fabricated using screen-printing method and they were tested under twelve light intensities for forward and backward illumination using warm white and daylight LEDs. The TiO_2 film thickness was optimized, and the performance metrics, including current-voltage (J-V) characteristics were measured. The study also analyzed series resistance, shunt resistance, open-circuit voltage (V_{OC}), short-circuit current (I_{SC}), fill factor, and efficiency with respect to light intensities. Transmittance and absorbance of the Z907 dye were assessed. The V_{OC}, I_{SC} and efficiency was observed to be the highest when

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the module was under the day light LED in the forward illumination condition. The optimized DSMs achieved a power conversion efficiency (PCE) of over 6% under daylight LEDs under forward illumination and more than 3% under warm white LEDs. While dye-sensitized solar modules have several advantages for indoor applications, including their ability to work in low-light conditions and their design flexibility, they also have some limitations, such as long-term stability and efficiency compared to other types of solar cells. As technologyand research continue to advance, DSSCs / DSMs might become even more suitable for indoor photovoltaic applications.Optimizing the device with better components it could be utilized in several fields such as wireless sensorsand devices, low-light environments building-integrated applications etc. While dye-sensitized solar modules have several advantages for indoor applications, including their ability to work in low-light conditions and their design flexibility, they also have some limitations, such as long-term stability and efficiency compared to other types of solar cells. As technology and research continue to advance, DSSCs
/ DSMs might become even more suitable for indoor photovoltaic applications

Keywords: DSSC, Dye-Sensitized Modules, indoor photovoltaic applications, power conversion efficiency.

AP19

Electrochemical efficiency of CuAl2O4/rGO nanocomposite electrode material via hydrothermal root for supercapacitor applications

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Abstract

CuAl2O4/rGO nanocomposite have been synthesized by hydrothermal method. The synthesized products have been characterized by X-ray powder diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy, high resolution scanning electron microscopy (HR-SEM), and cyclic voltammetry (CV). XRD results showed that the synthesized products are well crystalline nature and exhibit rhombohedral structure. The chemical bonding or molecular structure were confirmed by FTIR. The nanosheet like morphology was observed in SEM analysis. EDS analysis confirmed the presence of elements Cu, Al and O. The pseudocapacitance behavior was recorded for the synthesized CuAl2O4/rGO electrode, which shows a specific capacitance value of 877 Fg−1 at 10 mVs−1. The cyclic stability of the prepared product showed a maximum of 85% retention in the electrode. Moreover, the electrochemical impedance spectral analysis revealed a good reversibility response of the CuAl2O4/rGO electrode. Hence, this study suggests CuAl2O4/rGO nanoparticles be the most desirable electrode material for supercapacitors.

Keywords: CuAl2O4/rGO, Morphology, Supercapacitor, Cyclic voltammetry, Hydrothermal method.

AP20

A Sensitive, Rapid Determination Of Moxonidine In Plasma By Lc-Ms And Its Application To Bioequivalence Study

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Abstract

The objective of this work is to determine the plasma concentrations of Moxinidine by liquid chromatography coupled with electron spray ionization (ESI) triple quad mass spectrometer (LC-MS/M) using internal method (Clonidine used as internal standard (ISTD)). Method development was conducted in such a way that sufficient sensitivity achieved and no short term and long term matrix effects effect the method performance. Sensitivity found superior in positive ionization than negative ionization. Sum of multiple daughter ions were used as mass transactions for Moxonidine are 242.05/206.1 & 242.05/199.05 where as single mass transaction was used for Clonidine are 230.1/213.1. Chromatography was optimized using Acetonitrile Buffer (10mmol Ammonium Acetate) (85:15) on Hypurity C8, 100 x 4.6 mm analytical column. Calibration curve found linear over the range 5.004 to 10345.023 mg/ml using 1x2 as weighting factor. Method development was initiated, aqueous and extracted CC standards (K_2EDTA as an anticoagulant) (5 pg/ml to 10 ng/ml) using LLE technique (ethyl acetate with basification) and found CC acceptable with LOQ area of ~2000 on API4000Qtrap, Acetonitrile and 10mmol ammonimum acetate was used as mobile phase in the ratio of 80:20 with 30µl injection on Inertsil ODS 150mm column, MRM was 242.05/206.1. Method found selective, no endogenous or exogenous interfences found either at analyte or internal standard retention times. The method is successfully applied to analyze 360 clinical study samples collected after administration of 25mg of Moxonidine in a IEC approved two phase clinical study.

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AP21

Influence of nb doping on structural, optical and electrical properties of tio2 thin film by chemical bath deposition method

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Abstract

Modern technology requires thin films for different applications. Thin films are thin material layers ranging from fractions of a nanometer to several micrometers in thickness. Thin films can improve the properties of a material's surface, such as its hardness, abrasion resistance, corrosion resistance, and electrical behaviour. Nb doped TiO_2 thin films synthesized by sol-gel dip coating method. The diffraction peaks of both samples are ascribed to the anatase and rutile phase of TiO_2. The average crystalline size of TiO_2 was found to be 25 nm and it was further decrease to 19 nm for 5 wt % Nb doped TiO_2 thin films. The SEM micrograph of Nb-TiO_2 consisting of many spherical shaped crystalline particles. The surface of the films is very smooth and the uniform crystalline size. A considerable red shift in the absorption edge was found to be Nb doped TiO_2 by UV-Vis absorption spectra. The functional groups were analyzed by using FTIR analysis. The defect in band gap energy and oxygen vacancy was analyzed by using PL emission spectra. The drastic decrease of resistivity or increase the conductivity of Nb doped TiO_2 confirm the Nb doping has significant improvement in the electrical properties of TiO_2 films. So these types of materials are preferable of gas sensing applications.

Key words : Sol – Gel dip coating method, FTIR, SEM , XRD, Photoluminous and UV analysis.

AP22

Synthesis and Spectral Studies on Metal Complexes of Imidazole Hydrazones Ligands Derived from Alkylcarbazates

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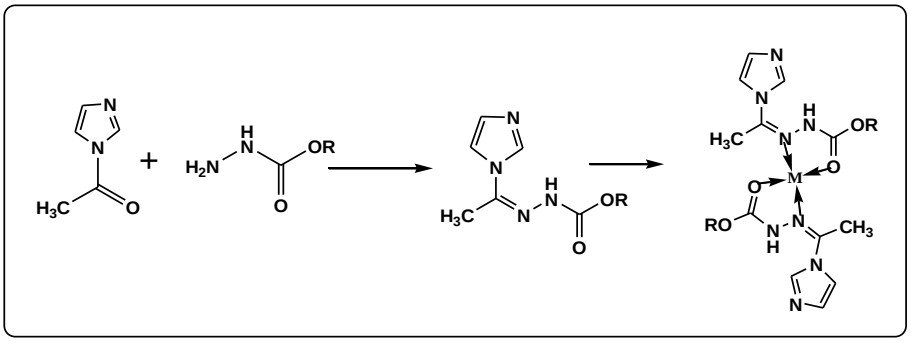
ABSTRACT

The synthesis, characterization, spectroscopic and biological evaluation of (E)-methyl-2-1H(imaidazole-2-yl)methylene)hydrazinecarboxylate.(HL^1) and (E)-ethyl-2-imidazole-2-yl)ethylene)hydrazinecarboxylate,(HL^2) with selected metal ions of Cobalt (II).Nickel Copper(II) and Zinc(II). The ligands, HL^1 and HL^2 were synthesized by condensation reaction of Alkylcarbazates with imidaozle . The reaction of metal salts with the resultant ligands, HL^1 and HL^2 produced solid complexes. The ligands and the complexes were characterized by Uv-visible (UV), Fourier Transform Infrared (FT-IR) spectroscopy, Nuclear Magnetic Resonance (^{1}HNMR&^{13}CNMR) spectroscopy, Thermal analysis (TG-DSC) and EI-Mass spectroscopy. Thus HL^1 and HL^2 behaved as tridentate N,O chelate with all coordinated respective metal ions centers. The synthesized ligands and their corresponding metal complexes were screened for anti-cancer activities against malaria parasite using in vitro technique. Using to measure the biological strength of the compounds with nanomaterials.

Key words: Hydrazone ligands , NO donor systems, Cobalt, Nickel and Copper Complexes



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AP23

Studies On The Growth And Characterization Of L-Asparagine Monohydrate Admixtured With L- Malic Acid Single Crystals

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Abstract

Single crystal of L-Asparagine monohydrate admixtured with L- malic acid (LAMLM) has been grown by slow evaporation solution growth technique by using deionized water as solvent at room temperature. Optically clear single crystals having dimensions up to 4mm x 3mm x 1mm. Powder X-ray diffraction analysis reveals that LAMLM crystal crystallizes by Orthorhombic system with space group of $P2_12_12_1$. The physical phase of the product was confirmed by powder x-ray diffraction analysis. The Fourier Transform Infrared (FTIR) spectra of all grown crystals have been recorded in the wavenumber range of 500-4500 cm^{-1} by KBr pellet technique and the associated functional groups of the grown crystals. The optical parameters, such as optical band gap energy, transparency (%) and absorbance were calculated parameters using UV-Vis Transmittance data in the spectral range of wavelength 190-1100 nm. The Multilayer plate-like pattern of growth was observed by Scanning electron microscopy. The presence ofatti L-Asparagine malate was confirmed by EDAX analysis. Incorporation of Various elements present in L-Asparagine malate in the crystal was confirmed by Energy Dispersive X-ray Analysis (EDX). The NLO studies shows that the LAMLM crystal belongs to Third harmonic generation (THG) material. The laser damage threshold for the grown crystal was measured using Nd:YAG Laser. The laser damage threshold value was found to be 3.6 GW/cm^2.

Keywords: organic acid, Slow evapouration method, XRD, FTIR, UV, SEM, EDAX, NLO and LDT.

AP24

Nanometerials, technology and applications

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Abstract

Nanomaterial refers to the basic unit of the material in three dimensions, at least one dimension size in the range of 1–100 nm. Nanomaterials can be divided into four categories according to dimension: zero-dimensional, one-dimensional, two-dimensional, and three-dimensional nanomaterials.Nanotechnology is the study of manipulating matter at the nanoscale, or on a scale of one billionth of a meter. It involves the design, production, and application of materials, structures, devices, and systems at this scale. Nanotechnology also lowers costs, produces stronger and lighter wind turbines, improves fuel efficiency and, thanks to the thermal insulation of some nanocomponents, can save energy. The properties of some nanomaterials make them ideal for improving early diagnosis and treatment of neurodegenerative diseases or cancer.

Keywords: manipulating ,nanocomponents, treatment, diseases.

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AP25

The rise of AI optoelectronic sensors

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Abstract

We have seen the significant influence of the information revolution brought about by optoelectronic sensing technologies on human civilization over the last few decades, especially in all aspects of big data, cloud servers, closed-loop systems, smart internet of things (IoT) gateway, artificial intelligence (AI), blockchain, and the metaverse. Undeniably, recent developments have accelerated the advent of the AI and IoT era. Herein, this review presented an overview of the progress, applications, and prospects of AI optoelectronic sensing technology. Firstly, inorganic semiconductors, organic optoelectronic materials, 2D materials, and other nanomaterials employed in optoelectronic sensing technologies are generalized systematically. Then, the development status quo of optoelectronic sensing technology is discussed deeply. Next, several application scenarios related to optoelectronic sensing technology are reviewed, demonstrating the great development and prosperity of intelligent application systems. Last, the future development trends of AI optoelectronic sensing technology are portrayed, that is, toward all-weather, versatile, and intelligent systems in the age of AI/IoT.

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AP26

Waste Water Treatment

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Abstract

Wastewater treatment is a process which removes and eliminates contaminants from wastewater. It thus converts it into an effluent that can be returned to the water cycle. Once back in the water cycle, the effluent creates an acceptable impact on the environment. It is also possible to reuse it. This process is called water reclamation.[1] The treatment process takes place in a wastewater treatment plant. There are several kinds of wastewater which are treated at the appropriate type of wastewater treatment plant. For domestic wastewater the treatment plant is called a Sewage Treatment. Municipal wastewater or sewage are other names for domestic wastewater. For industrial wastewater, treatment takes place in a separate Industrial wastewater treatment, or in a sewage treatment plant. In the latter case it usually follows pre-treatment. Further types of wastewater treatment plants include Agricultural wastewater treatment and leach ate treatment plants.One common process in wastewater treatment is phase separation, such as sedimentation. Biological and chemical processes such as oxidation are another example. Polishing is also an example. The main by-product from wastewater treatment plants is a type of sludge that is usually treated in the same or another wastewater treatment plant.

Key words: Pollution elimination, waste contaminants. phase separation, sedimentation, sewage treatment, removal of coarse particle

AP27

Positron emission tomography

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Abstract

Positron Emission Tomography (PET) is a powerful imaging modality widely used in medical diagnostics, particularly for cancer, neurology, and cardiology. Advanced techniques in PET imaging, such as time-of-flight (TOF) PET, dynamic PET, and hybrid imaging (e.g., PET/CT, PET/MRI), have significantly enhanced its resolution, sensitivity, and quantitative accuracy. These innovations have improved diagnostic precision, facilitated early disease detection, and enabled more personalized treatment planning. Additionally, the integration of artificial intelligence and machine learning in image reconstruction and data analysis has further advanced the capabilities of PET, reducing noise, and optimizing image quality. This paper reviews these advanced techniques and their impact on clinical applications, emphasizing their potential for improving patient outcomes and the future direction of PET technology.

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AP28

Recent biosensor technology on their Applications in diagnostics and environmental analysis

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Abstract

Recent advances in biosensor technology have expanded their applications in both diagnostics and environmental analysis, offering precise, real-time, and cost-effective solutions. In diagnostics, biosensors have been widely applied in detecting biomarkers for diseases such as cancer, diabetes, and infectious diseases, enabling early detection and personalized healthcare. The integration of nanomaterials, microfluidics, and advanced signal processing has enhanced the sensitivity and specificity of these devices. In environmental analysis, biosensors are utilized to monitor pollutants, toxins, and pathogens in water, air, and soil, providing rapid and reliable data for environmental protection and public health. Innovations in wearable and portable biosensors have further improved accessibility and scalability, positioning biosensors as critical tools in medical diagnostics and environmental monitoring.

Keywords- Diagnostics , Pollutants, Toxinns, Pathogens in water.

AP29

Renewable energy storage converting chemical energy into electrical energy through electrochemical reactions.

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Abstract

Renewable energy storage through electrochemical processes involves converting chemical energy into electrical energy using systems such as batteries, fuel cells, and flow batteries. These technologies store excess energy generated from renewable sources like solar and wind by facilitating reversible chemical reactions. During energy generation, the stored chemical energy is converted back into electrical energy through oxidation-reduction reactions. This method of energy storage is crucial for overcoming the intermittency of renewable energy, ensuring a consistent and reliable energy supply. The efficiency, scalability, and environmental impact of these systems make them key components in the transition to sustainable energy solutions.

Keywords- Renewable energy , Chemical energy, Electrical energy, Scalability.

AP30

Overview of Super capacitors store electrical energy through electrostatic and charge accumulator.

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Abstract

Recent advances in biosensor technology have expanded their applications in both diagnostics and environmental analysis, offering precise, real-time, and cost-effective solutions. In diagnostics, biosensors have been widely applied in detecting biomarkers for diseases such as cancer, diabetes, and infectious diseases, enabling early detection and personalized healthcare. The integration of nanomaterials, microfluidics, and advanced signal processing has enhanced the sensitivity and specificity of these devices. In environmental analysis, biosensors are utilized to monitor pollutants, toxins, and pathogens in water, air, and soil, providing rapid and reliable data for environmental protection and public health. Innovations in wearable and portable biosensors have further improved accessibility and scalability, positioning biosensors as critical tools in medical diagnostics and environmental monitoring.

Keywords- Biosensor, Signal Processing, Environmental Monitoring.

AP31

Quantum Dots and Applications

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Abstract

The use of semiconductors has greatly increased in the last century. As new technologies start to rely more and moreon semi-conductors, their shortcomings are more and more apparent. Traditional semi-conductor devices have been found to be too big and too slow. As engineers search for a faster and more adaptable alternative to conventional semiconductors they have discovered quantum dots, a new form of semiconductors that model atoms. Being only nanometers in size, these pseudo-atoms take semi-conductors to a whole new level and can allow devices to work almost at the speed of light. Furthermore, quantum dots have numerous applications in optical technologies, mediums, and industries. This paper reviews the basics of quantum dot, its properties and some applications. Semiconductor quantum dot (QD) is a promising material for the next generation high speed optical communication devices.

Keywords— Quantum dot, Electronic state density, Quantum well, Quantum computing, Quantum dot Lasers, Quantum dot

AP32

Futhure Trends Of Perovskite Solar Cell

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Abstract

Solar cell is an electrical device, which converts the light energy into electrical energy through the photovoltaic (PV) effect. Solar cells are classified into two categories, which are wafer-based cell and thin film–based cell. The drawbacks of wafer-based solar cell are low absorption coefficient, expensive, and efficiency of the cell will decrease in high temperature and low light conditions. To overcome these drawbacks Perovskite thin-film solar cell has been introduced with high absorption coefficient, flexible, lightweight, and the efficiency has been increased in high temperature and low light conditions. The main objectives of this chapter are to briefly discuss the origin, characteristic features, properties, applications, challenges, and future trends of perovskite solar cell.

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AP33

Crystal Growth, Experimental And Theoretical Investigation Of Organic Nlo Material 4-Nitrobenzonitrile

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Abstract

Commercially available 4-nitrobenzonitrile (98% Alfa aesar) was dissolved in 50 ml of ethanol by using magnetic stirrer for 2 hours at 40^0C to get the homogenous solution.The Powder and single crystal XRD technique confirm that the grown crystal crystallizes in a monoclinic system with non-centro symmetric space group $P2_1$. The grown crystal has transparent nature in the entire visible and NIR region. The optical band gap energy is 6.0 eV. The photoluminescence spectrum confirms the suitability of crystal for optoelectronic applications. TGDTA confirmed that the crystal has good thermal stability. Theoretical calculation of hyperpolarizability and frontier molecular orbitals also asserts the suitability of the material for the frequency conversion process. The Kurtz and Perry technique confirms that the grown crystal has 3.8 times greater relative SHG efficiency when compared to urea. High relative conversion efficiency authenticates the applications of the grown crystal in the field of NLO. The single crystal of 4 NBN was grown by slow evaporation technique.

Keywords: XRD,UV- Analysis, FTIR,FT- Raman, TGDTA.

AP34

Solar Power System And Enviranmental Benefits

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Abstract

The need for electric energy, which is an indispensable part of life, is increasing with each passing day in parallel to the developments in technology. However, the fact that costs rise in meeting these needs, and that damage is done to nature while energy is being obtained bring clean energy sources such as solar and wind energies to the agenda. The solar panel was set placed under the sun at 45^{o} south, there the peak sun irradiation was on the panel surface and then at 39.5 volts was observed using a multimeter. While observing the voltage, the panel was slightly adjusted and the voltage varied at an angle away from the sun, the voltage depreciated. The output from the solar panel was connected to the charge controller with respect to their polarities and when the output voltage was observed, it then read 26 volts which was right for charging 24 volts battery, since the two 12 volts batteries were connected in series. Each battery read 12.8 volts each and then connected in series to give an output of 24 volts afterwards was connected to the inverter. The voltage was 25.7 volts DC because the solar and the charge controller were also connected but without load, then load was added to the inverter which gave an output of 220 volts and was left for about 30 minutes after then it was observed again and the voltage did not vary. The inverter had three indicators. When tested with the volt meter as it was plugged on the mains out, it read 14.4 volts which was basically because of the state of the charge level of the batteries. Since the inverter included a triple cycle charger, it could continue to maintain the battery with equalization charge voltage of about 12 volts just to make sure that the battery does not discharge even it was on standby mode.

Keywords: Multimeter, Inverter, Control Pannal,24 Volts battery.

AP35

Solution-processed, high-performance light-emitting diodes based on quantum dot

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Abstract

Solution-processed optoelectronic and electronic devices are attractive owing to the potential for low-cost fabrication of large-area devices and the compatibility with lightweight, flexible plastic substrates. Solution-processed light-emitting diodes (LEDs) using conjugated polymers or quantum dots as emitters have attracted great interest over the past two decades[1,2]. However, the overall performance of solution-processed LEDs—including their efficiency, efficiency roll-off at high current densities, turn-on voltage and lifetime under operational condition- Here we report a solution-processed, multilayer quantum-dot-based LED with excellent performance and reproducibility. It exhibits colour-saturated deep-red emission, sub-bandgap turn-on at 1.7 volts, making this device the best-performing solution-processed red LED so far, comparable to state-of-the-art vacuum-deposited organic LEDs. We anticipate that our results will be a starting point for further research, leading to high-performance, all-solution-processed quantum-dot-based LEDs ideal for next-generation display and solid-state lighting technologies.

Keywords. LED, Bandgap,Quantum dot,Deep red emittion

AP36

Precision and innovation for High - Performance materials

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Abstract

Crystal growth using advanced techniques and development of methods for producing high-quality crystals with precise control over their size, structure, and properties. These methods are crucial for applications in electronics, optics, and materials science. Advanced techniques such as molecular beam epitaxy (MBE), chemical vapor deposition (CVD), and laser-assisted growth allow for the fine-tuning of crystal properties at the atomic level. These approaches also enable the growth of complex crystal structures, including heterostructures, quantum dots, and nanowires, which are essential for the next generation of semiconductor devices and high-performance materials. These methods are essential for producing materials with superior performance in fields such as electronics, photonics, and energy. By integrating cutting-edge computational modeling and real-time monitoring, crystal growth processes are becoming more efficient, scalable, and capable of producing next-generation materials with unprecedented precision and functionality.

Keywords. MBE, CVD, Quantum dots,real time monitors

AP37

Enhancing Precision and Innovation in Healthcare

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Abstract

Medical physics, plays a pivotal role in the development and application of cutting-edge technologies for diagnosis, treatment, and monitoring in healthcare. This field integrates principles of physics with medical science to improve the precision and efficacy of medical procedures. Advanced imaging techniques, such as magnetic resonance imaging (MRI), positron emission tomography (PET), and computed tomography (CT), offer high-resolution, real-time visualization of internal structures. In radiation therapy, innovations like intensity-modulated radiation therapy (IMRT) and proton therapy enable precise targeting of tumors while sparing healthy tissues. Additionally, advancements in computational modeling, artificial intelligence, and machine learning are enhancing diagnostic accuracy and treatment planning. These techniques collectively contribute to improved patient outcomes, reduced treatment side effects, and the evolution of personalized medicine.

Keyword.MRI , PET,IMRT,Computational modeling.

AP38

Enhancing Efficiency and Sustainability

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Abstract

Wastewater treatment is essential for protecting public health and preserving the environment. Traditional methods, while effective, often fall short in addressing the growing complexity of contaminants, including pharmaceuticals, heavy metals, and emerging pollutants. Advanced treatment techniques have emerged to enhance the efficiency and effectiveness of wastewater management. These techniques include membrane filtration (such as reverse osmosis and ultrafiltration), advanced oxidation processes (AOPs), and biological treatments using engineered microbes. Innovations such as nanotechnology and electrochemical methods are also being explored for higher contaminant removal efficiency. This paper reviews the application of these advanced techniques, focusing on their potential to improve effluent quality, reduce environmental impact, and contribute to sustainable water reuse. The integration of these advanced systems with existing infrastructure provides a promising path towards addressing the challenges posed by modern wastewater contaminants.

Keywords. Health and environment, advanced oxidation processes (AOPs), and biological treatments using engineered microbes.

AP39

Super Capacitor and batteries

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Abstract

Superconductivity allows current to pass through a material with no resistivity at near absolute zero temperature. It also exhibit meissner effect which causes the superconducting material to repel magnetic fields. The application of this technology has been extremely limited due to the high cost of using helium to cool the material to the critical temperature. Recently, however the inventions of high temperature superconductors are made remarkable discoveries. In the present world, superconductors are being used in almost all the fields such as telecommunication, medical, space, defense etc. In this paper, some of these applications are highlighted along with the most fascinating manifestation of superconductivity- the levitating action. A bio-battery includes a bimolecular energy source, a first electrode and a second electrode. In some configurations, a bio-battery may also include a first cell containing the first electrode and the bimolecular energy source, and a second cell having a reducible substrate and the second electrode. The first cell can be in ionic communication with the second cell, for example by a proton exchange membrane. Various bimolecular energy sources can be used, including proton donor molecules or electrolytic ally oxidizable molecules.

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AP40

Microstructure, Optical And Dielectric Properties Of Sno2 Nanoparticles By Microwave Irradiation Method

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Abstract

Nanotechnology literally means any technology on a nanoscale that has applications in the real world. It is defined as fabrication of devices with atomic or molecular scale precision. Nanocrystalline SnO_2 synthesized by a novel microwave irradiation method with in 10 min. Powder XRD results confirm that crystalline with tetragonal rutile type structure and the crystalline size was found to be 30 nm. TEM studies illustrate that the SnO_2 was spherical shaped morphology with size in the ranging from 25-30 nm. The optical band gap energy of SnO_2 was estimated to be 3.55 eV. The functional groups were confirmed by FTIR spectra analysis. Defects in crystals and oxygen vacancies were analyzed by using photoluminescence spectra analysis. Frequency dependence dielectric anomaly is observed in SnO 2 nanoparticles at low temperature. At low temperature, dielectric constant and dielectric loss decreases with frequency but increases with temperature. Therefore, it is concluded that the prepared microwave assisted SnO 2 nanoparticles could be a potential candidate for high density energy storage materials.

Key words : FTIR, TEM , XRD, Photoluminous and UV analysis.

AP41

A Review On Materials For Optoelectronics Applications

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Abstract

Unlike other silicon based electronic devices optoelectronic devices are primarily made from III-VI semiconductor compounds such as GaAs, InP, GaN, GaP, GaSb, and their alloys since they are of direct band gap materials. Understanding the properties of these materials in the production of optoelectronic devices has been of critical importance. After the first demonstration in the early 1960s, of a semiconductor laser, optoelectronic devices have been developed in their millions, pervading our everyday lives in communications, computing, entertainment, lighting, and medicine.

Key Words: Optoelectronics, Quantum Wells, LEDs, Photodetectors, Solar cells.

AP42

Fabrication and Characterization of Manganous Films and Ag/n-Mn/p-Si/Ag Junction Diode for Optoelectronic Device Applications

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Abstract

Remarkable attention in research, we have create a junction diode based on manganous thin films, film was spray on a glass plate and silicon substrate by low-cost jet nebulizer spray pyrolysis coating method with varying substrate temperature 300°C, 400°C, 500°C and 600°C. X-ray diffraction (XRD) pattern revealed the monoclinic crystalline Phases of Mn thin films along with improved gain size. The UV-vis results revealed that the band gap obtained view a decreasing trend on increasing the substrate temperature, In particular, the current and voltage (I-V) characteristic diode parameters of Ag/Mn/n-Si/Ag diodes under dark and light conditions were analysed. The maximum barrier height (Φ_b) for the diode fabricated substrate temperature 400°C in light condition was observed 0.74eV. Also, minimum idealist factors (n) 3.14 were observed. From I-V analysis revealed that fabricated junction diodes more appropriate for the development of photodiodes and photo detector applications.

Keywords: Diode; thin films; interfacial layer; spray pyrolysis; optoelectronic applications;

AP43

Synthesis and Characterization of Mn-Zn Ferrite Nanoparticles for Enhanced Magnetic and Catalytic Properties

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ABSTRACT

Manganese-zinc ferrite (Mn-Zn Fe2O4) nanoparticles have been synthesized using the coprecipitation method. The structural, morphological, magnetic, and catalytic properties of the synthesized nanoparticles were investigated using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), vibrating sample magnetometry (VSM), high-resolution transmission electron microscopy (HRTEM), field emission scanning electron microscopy (FESEM), X-ray photoelectron spectroscopy (XPS), and Brunauer-Emmett-Teller (BET) analysis. XRD results confirmed the formation of a single-phase spinel structure. FTIR spectra revealed the characteristic absorption bands of Mn-Zn ferrite. VSM measurements showed that the nanoparticles exhibited a high saturation magnetization and low coercivity, indicating their potential for magnetic applications. HRTEM and FESEM images revealed the spherical morphology and uniform size distribution of the nanoparticles. XPS analysis confirmed the presence of Mn, Zn, Fe, and O in the desired oxidation states. BET analysis revealed a high specific surface area, suggesting excellent catalytic activity. The synthesized Mn-Zn ferrite nanoparticles demonstrated promising magnetic and catalytic properties, making them potential candidates for various applications, including magnetic data storage, magnetic fluid hyperthermia, and catalytic degradation of pollutants

Keywords: XRD, FTIR, VSM, HRTEM, FESEM, XPS, BET analysis.

AP44

Electronic Band Structure of Monolayer Phosphorene using First Principle Calculations

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Abstract

Phosphorene is a single layer black phosphorus and has distinct puckered honeycomb structure. The structure leads to anisotropic behaviour, and contributes for its electronic properties. The recent reports have shown the importance of anisotropic properties of phosphorene in various applications[1,2]. The unique properties make phosphorene a potential game-changer in fields of electronics, optoelectronics and energy storage[1–3].

In the present work, we have performed electronic band structure calculations of monolayer phosphorene using first principle study employing Quantum Espresso. Perdew-Burke-Ernzerhof generalized gradient approximation (PBE-GGA) scheme is employed for exchange – correlation potential approximation. The band structure of phosphorene is observed to be anisotropic along $\Gamma - X$ and $\Gamma - Y$ directions. The direct energy band gap ($\sim 1\ eV$) is observed for phosphorene and is higher compared to bulk phosphorus. The effective mass of carriers in phosphorene are investigated and found to be anisotropic. The band structure analysis helps for advancing in fundamental research and practical innovations in materials science.

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AP45

Computational Exploration of Antimicrobial Activity, Ligand-Protein Interactions, and Property Investigation on 2-(2-hydroxybenzoyl)-5-methoxyphenol

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ABSTRACT :

In this article, conceptual research of 3-(4-Amino-1,3-Dihydro-1-Oxo-2h-Isoindol-2-Yl)-2,6-Piperdinedione and its anti-microbial activity, docking was done. The header compound features a piperidine core flanked by a benzene ring on one side with an amino acid and on the other side with a double bond oxygen, forming its fundamental structure. To assess biological activity, the header compound underwent testing against Escherichia coli and Staphylococcus aureus microorganisms using two methods: Well Diffusion and Minimum Inhibitory Concentration. Furthermore, the header compound was subjected to docking with a fungal Curvularia Lunata protein (PDB ID: 3IS3) to identify optimal molecular interactions. The resulting molecule exhibited a 3.88 µM inhibition constant with a binding energy of -7.34. Geometric parameters such as Bond Angle and Bond Length, as well as Molecular Electrostatic Potential, FT-IR, FT-Raman, UV-Vis, and HOMO-LUMO analyses of the header compound, were carried out using the DFT/B3LYP method with the basis set 6-311++G(d,p).To understand the most reactive site and elucidate structural features, Molecular Electrostatic Potential (MEP) and HOMO-LUMO studies were conducted. Additionally, a drug-likeness factor assessment was performed.

AP46

Green Synthesis of Silver Nanoparticles Using Citrus Limetta Peel Extracts and Their Antibacterial Activity

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Abstract

$AgNo_3$ nanoparticles were synthesized using Citrus Limetta (Lemon) peel extract as a reducing agent. The synthesis process involved the reaction of silver nitrate with Lemon peel extract. XRD analysis revealed the crystalline structure of the nanoparticles. SEM images showed spherical particles with a uniform size distribution. FTIR analysis confirmed the presence of functional groups from the extract. UV-Vis spectroscopy showed an absorption peak at 340 nm. Antibacterial activity was evaluated against E. coli and S. aureus. The green synthesis method provides an eco-friendly approach. Lemon peel extract offers a sustainable source for Silver nanoparticle synthesis. The nanoparticles exhibited high surface area and optical absorption. They have potential applications in biomedical, cosmetic, and environmental fields. The study demonstrates a new approach for synthesizing Silver nanoparticles.

KEYWORDS:

Antibacterial studies; Citrus Limetta; Green Synthesis; silver nanoparticles

AP47

The impact of Metal oxide on doped graphene oxide for photodegradation application.

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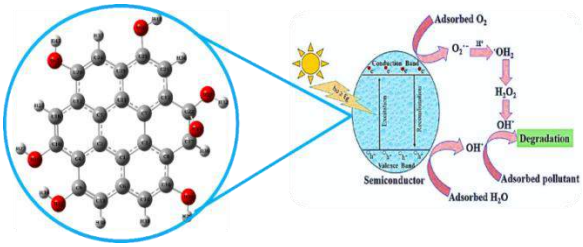
Abstract

The present work aims to synthesize metal oxides combined with doped graphene oxide, which was characterized using HR-TEM, UV-Vis, FT-IR, and P-XRD analysis. Alkaline earth metals are shortlisted to decorate on the graphene oxide surface. For doping, nitrogen and boron have been designed due to their unique properties. The materials' structure, band gap, and functional groups were evaluated through experimental and theoretical aspects. Many pollutants, sulfates, candies, and other heavy metals were injected into the river sides, which caused water pollution. Considering these issues, the material was tested for its photocatalytic ability. The synthesized materials were tested against pollutants and antibiotics to determine their degradation ability. The photodegradation was performed against Rhodamine-B and Metronidazole. The photodegradation was initiated at different catalyst dosages (10 mg, 30 mg, and 50 mg). The best dosage that degrades the pollutants was evaluated, and the active metal oxide was also identified. The study deals primarily with the attachment of metal oxide and doped graphene oxide, which may affect the photocatalytic application. The material's band gap, active species, metal oxide, and dopants may influence the photodegradation efficiency. In addition, theoretical calculations were also performed to evaluate the experimental infirmity. Comparing the experimental results, we see that both materials significantly impact the pollutants.

Keywords: Nitrogen-doped Graphene oxide, photocatalyst, pollutants, antibiotic, Superoxide radicals.



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AP48

The role of rare earth metals in graphene oxide decorated with metal oxide for Sunlight influenced degradation.

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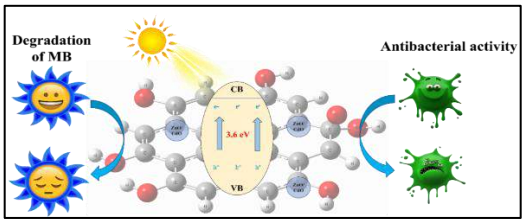
Abstract

The aim of the work is to synthesize transition metal oxides with doped-graphene oxide, which was characterized using HR-TEM, UV-Vis, FT-IR, and P-XRD analysis. Transitions have been shortlisted to decorate the graphene oxide surface for doping purposes. Rare earth metals have been preferred. The trinary material was described, and its structure, band gap, and functional groups were evaluated. Water is considered one of the most valuable and endangered in the current situation. Many pollutants, sulfates, candies, and other heavy metals were injected into the river sides, which caused water pollution. Considering these issues, the material was tested for its photocatalytic ability. The synthesized materials were tested against pollutants to determine their degradation ability. The photodegradation was performed against p-nitrophenol and Levofloxacin. The photodegradation was initiated at different catalyst dosages (10 mg, 30 mg, and 50 mg). The best dosage that degrades the pollutants was evaluated, and the active metal oxide was also identified. The studies deal with whether rare earth metals influence degradation efficiency. The band gap of the material, pH of the solution, active species, and the metal oxide may influence the photodegradation efficiency. In addition, theoretical calculations were also performed to evaluate the experimental infirmity. Comparing the experimental results, we see that both materials significantly impact the pollutants, suggesting a potential solution to water pollution.

Keywords: Graphene oxide, photodegradation, rare earth metals, sunlight, pollutants.



 ISBN: 978-819-770-0460

AP49

Superconductors and its Application

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Abstract

Superconducting magnetic energy storage systems store energy in the magnetic field created by the flow of direct current in a superconducting coil that has been cryogenically cooled to a temperature below its superconducting critical temperature. An "electrolytically oxidazable biomolecule" includes, for example, a biomolecule that may be oxidized at an electrode to provide a source of electrons."In ionic communication" includes, for example, protons in a cell that may be transported, such as by diffusion though the proton exchange membrane to another cell. Superconductivity allows current to pass through a material with no resistivity at near absolute zero temperature. It also exhibit meissner effect which causes the superconducting material to repel magnetic fields. The application of this technology has been extremely limited due to the high cost of using helium to cool the material to the critical temperature. Recently, however the inventions of high temperature superconductors are made remarkable discoveries. In the present world, superconductors are being used in almost all the fields such as, some of these applications are highlighted along with the most fascinating manifestation of superconductivity- the levitating action. A bio-battery includes a biomolecular energy source, a first electrode and a second electrode. In some configurations, a bio-battery may also include a first cell containing the first electrode and the biomolecular energy source, and a second cell having a reducible substrate and the second electrode. It also used in various field telecommunication, medical, space, defense etc. In this paper

Keywords: oxidazable biomolecule, energy storage systems, bio-battery, magnetic field, ionic communication

AP50

Synthesis And Characterization Of Titanium Dioxide Doped With Zinc And Alanine Nano Particles By Microwave Irradiation Method

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Abstract

Titanium dioxide (TiO2) is the most investigated semiconductor in photo catalysis, but the photocatalytic performance can be further improved by rational design of the material as nano structure with special surface and structural properties. The present work describes synthesis and characterization of Titanium dioxide (TiO_2) nano particles. Titanium dioxide doped with Zinc Oxide (ZnO) and L- Alanine kept at 300 ^oC , nano particles were synthesized using microwave Irradiation method. The synthesized nano particle was characterized by different studies like X- ray Diffraction method(XRD) , UV –VIS spectroscopic technique. The fine size of nano particles are calculated using scherrer formula and dislocation density is also calculated from XRD. The given results of UV-VIS spectrometry showed the energy band gap. TiO_2 doped with ZnO and Alanine is being used frequently for photo degradation of organic molecules, photocatalytic properties and conductivity. This thesis describes the advances in the syntheses, properties and applications of TiO_2 doped with ZnO and Alanine nano structures besides, efforts are also made to discuss the working mechanism and future challenges and perspectives.

Key Words: TiO2:ZnO : Alanine Microwave method, XRD , UV – VIS

AP51

Synthesis And Characterisation Of Bismuth Oxide Doped With Tio_2 Nano Compsites By Microwave Irradiation Method In Sol-Gel Process

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Abstract

Bismuth Oxide (BiO_2) and TiO_2 have been taken as equimolar ratio and were synthesised by microwave irradiation technique at 400^0 C. BiO2 – TiO2 nano composites were characterized by X-Ray Diffraction (XRD) analysis. The morphological studies have been carried out from SEM studies. The functional groups and different modes of vibrations were confirmed by FTIR spectrum analysis. Crystal defects and oxygen vacancies were characterised using Photoluminescence spectrum analysis. The presence of elements like Bismuth, Titanium and oxides were confirmed by EDAX study.

Key Words: TiO2:BiO_2, Microwave method, XRD , UV – VIS, FTIR

AP52

Computational design of azido Based nitro compounds by DFT calculations

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Abstract

In this paper for the first time quantum calculations method - DFT can be used to identify the properties of drug delivery system and molecules based on the anti -viral drug research. In this these three compounds, 3-azido-1-nitro-1H-1,2,4-triazole, 4-azido-1,2,5-oxadiazole-3-amine, 3-azido-4-nitro-1,2,5-oxadiazole molecules are compared . The molecular optimization performed by molecular calculations and density functional methods (DFT). All these calculations were carried out using the gaussian 09 program. The geometry of the above mentioned compounds are optimized using B3LYP level with this 6-311++G (d,p) basic set are performed. The theoretical values calculated are oxygen balance (OB), Impact sensitivity calculated by nitro group charges, Frontier molecular orbital (FMOs), molecular electrostatic potential (MEP), energy gap between HOMO and LUMO, Natural charge distribution (NBO charges) and NBO analysis. The Oxygen balance is compared between these above mention molecules are (-25.8), (-50.7) and (-10.2) respectively. The azido based nitro compounds, 4-azido-1,2,5-oxadiazole-3-amine has highly sensitive oxygen balance (-50.7). similarly other parameters are discussed successfully by theoretical calculations.

Keywords : Density functional theory, MEP, Oxadiazole, Explosives

AP53

SYNTHESIS AND CHARACTERIZATION STUDIES OF COBALT DOPED BARIUM SULFATE NANOPARTICLES BY COPRECIPITATION METHOD

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ABSTRACT

Cobalt doped Barium Oxide nanoparticles were synthesized by co-precipitation method. The obtained samples were characterized by (XRD), (SEM), (EDS), (FTIR) and (UV –VIS). Cobalt is a lustrous, brittle, silver-white metal with a bluish tinge that has it is a hard ferromagnetic, silver-white, lustrous, brittle element. Barium is a soft, silvery-white metal, with a slight golden shade. Barium has a medium specific weight and high electrical conductivity. The XRD analysis indicates that the synthesized nanoparticles have the spherical structure. The surface morphology of synthesized materials was investigated by SEM. The compositions elements were confirmed by EDS. The other properties were analyzed by FTIR and UV-VIS Spectroscopy.

Keyword: Cobalt, Barium oxide nanoparticles, XRD, SEM, EDS, UV-V

AP54

SYNTHESIS AND CHARACTERIZATION STUDIES OF COBALT DOPED ZINC OXIDE NANOPARTICLES BY CO-PRECIPITATION METHOD

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ABSTRACT

Pure ZnO and Cobalt (Co) doped ZnO nanoparticles (NPs) were synthesized by Co-precipitation method. ZnO is largely inert white compound which is used very widely as a building agent or filter and as a white precipitate. I t is extensively utilized in the food industry to preserve colours and prevent spoilage through their antibacterial activity. The nanoparticles have been characterized by different techniques, x-ray diffraction (XRD), FTIR, field emission scanning electron microscopy (FESEM), energy dispersive x-ray (EDAX) spectroscopy and the optical, structural, morphological and chemical properties of the Cobalt doped zinc oxide was investigated by uv-vis spectrometer.

Keywords: Co doped ZnO Nanoparticles Co-precipitation, XRD, FTIR, SEM with EDX, UV-Vis.

AP55

Biogenic Zinc Oxide Nanoparticles synthesized from Birch extract induce oxidative stress, mitochondrial damage and apoptosis in Colorectal Cancer

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Abstract

A sustainable and cost effective approach was employed to develop Biopolymer-based Zinc Oxide Nanocomposites (BZNCs) suitable for biomedical purposes. Our research showcases the potential of these BZNCs as versatile tools for diagnostic sensing and therapy. Zinc, as one of the major trace elements of the human body and co-factor of more than 300 mammalian enzymes, plays an important role in maintaining crucial cellular processes including oxidative stress, DNA replication, DNA repair, cell cycle progression and apoptosis. Thus, it is evident that an alteration in zinc levels in cancer cells can cause a deleterious effect. Research has shown that low zinc concentration in cells leads to the initiation and progression of cancer and high zinc concentration shows toxic effects. Characterization of the BZNCs was carried out using SEM-EDX, FT-IR, XRD, and particle size analysis, while their optical properties were examined with UV spectrophotometry. Our findings revealed a particle size of 51nm when using optimized values of 1mM $ZnSO_4$, 5g *Birch* leaf extract, and 37°C temperature.MTT assay results indicated a decrease in cell viability, ranging from 50-10%, as the concentration of BZNCs increased against MCF-7 breast cancer cell line. Cellular morphology observed through phase-contrast microscopy images supported these findings. Notably, high anticancer activity was observed within a lower concentration range of BZNCs, highlighting their potential for diverse applications in

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nanobiomedicine. **Keywords:** Biopolymer; Zinc Oxide Nanocomposites; *Birch* Leaf Extract; Anticancer Activity; Box-Behnken Design; Nanobiomedicine.

AP56

GREEN SYNTHESIS OF SILVER NANOPARTICLES FROM *GYMNEMA SYLVESTRE & ZINGIBER OFFICINALE* EXTRACT AND ITS BIOLOGICAL ACTIVITY

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Abstract

The term "nanotechnology" refers to the creation, representation, manipulation, and use of structures through the control of shape and size at the nanoscale. Traditional chemical methods to medical and environmental technologies are only a few of the sectors where nanotechnology has successful applications. In addition, the green synthesis methodology for producing metal nanoparticles is a quick, environmentally friendly and nontoxic method. Nanotechnology is the science of creating, utilizing, and applying nanostructures or nanomaterials as well as examining how different material properties relate to their nanoscale dimensions. Utilizing the Silver Nitrate, *Gymnema Sylvestre* and *Zingibre Officinale* was synthesized AgNPs a Co precipitation assisted technique. Characterization of the AgNPs was carried out using SEM, TEM, XRD, IR and particles size analysis while their optical properties were examined with UV spectrophotometry.

Keywords: AgO, UV –Visible, XRD, FT-IR and Antimicrobial activity.

AP57

Synthesis of Zinc Nanoparticles using Ocimum sanctum Extract and it's antibacterial activity

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Abstract:

Ocimum sanctum (Tulasi) extract was used to synthesize Zinc nanoparticles (ZnONPs) through a green and eco-friendly approach. The synthesized ZnONPs were characterized using UV-Vis spectroscopy, XRD, SEM and TEM. The AgNPs exhibited significant antimicrobial activity against various pathogens, including Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans, and Aspergillus niger. The antimicrobial efficacy of ZnONPs was attributed to their small size, high surface area, and release of silver ions. The Ocimum sanctum-derived ZnONPs showed potential applications in wound healing, water purification, food packaging, and medical implants. This study demonstrates the use of Tulasi extract as a reducing agent for ZnONPs synthesis, offering a sustainable and cost-effective approach for developing antimicrobial agents.

Keywords: Antibacterial activity, Green nanotechnology, *Ocimum sanctum*, Zinc nanoparticles

AP58

Green Synthesis of Copper Nanoparticles Using Citrus sinensis Peel Extracts and Their Antibacterial Activity

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Abstract

Copper(II) oxide (CuO) nanoparticles (NPs) were synthesized by the calcination of a mixture of copper acetate and orange peel powder at 600 °C for 4 h. The average crystallite size and structure of the prepared sample was predicted by X-ray diffraction (XRD) analysis. Optical property of the sample was measured by using UV-visible absorption spectroscopy. Fourier transform infrared (FT-IR) spectroscopy was employed to find metal-oxygen bond and surface groups of the sample. Both scanning and transmission electron microscopic analyses reveal that the CuO particles adopt leaf and irregular plate-like morphologies. The average length of CuO nanoleaves is 54 nm. The effect of morphology by different types of orange peel powders was also investigated.

Keywords: Copper(II) oxide, orange peel, XRD, FT-IR, morphology

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AP59

Effect of *Calotropis gigantea* (L.) Dryand. leaf mediated silver nanoparticles against developmental stages of dengue vector *Aedes aegypti* L.

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ABSTRACT

Mosquitoes transmit dreadful diseases to human beings wherein biological control of these vectors using plant-derived and its associated molecules would be an alternative to reduce mosquito population. Aqueous leaf extract and green synthesized silver nanoparticles (Ag NPs) from *Calotropis gigantea* (L.) Dryand. leaf were investigated for their efficacy against the dengue vector *Aedes aegypti* L. (Diptera; Culicidae). The biologically synthesized Ag NPs were characterized by UV–vis spectrum, X-ray diffraction, Fourier transform-infrared and surface characteristics by Scanning Electron Microscopy. Further, on exposure of the larvae to varying concentrations of aqueous leaf extracts and Ag NPs for 24 h, these Ag NPs showed 100 % mortality from first to fourth instars and pupae of *A. aegypti* at 0.20 %, which is the highest concentration, tested, wherein it was the lowest concentration of aqueous leaf extract alone which showed only 20–40 % of mortality. Lethal concentration (LC_{50}) values of Ag NPs against the larval and pupa stages were 0.460, 0.352, 0.331, 0.217, and 0.160 % with no mortality in control. These results suggest that the use of *C. gigantea* silver nanoparticles can be a rapid, environmentally safer bio-pesticide which can form a novel approach to develop effective biocides for controlling the target vector.

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AP60

Energy Storage properties of Cerium Oxide Nanoparticles by Sol-Gel and Hydrothermal Method

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Abstract

The lifetime and charge-amassing characteristics of super capacitors (SCs) are critical for the electronic devices. In this way, we report CeO_2 nanoparticles (NPs) prepared through Sol-Gel and hydrothermal processing. The synthesized nanoparticles were characterized by Powder XRD, FTIR, UV-Vis and SEM studies. The XRD analysis confirms the structure of Cerium oxide nanoparticles. The FTIR vibration spectra confirmed the composition of the product. The Wavelength of the sample has been showed from the UV-Vis investigation. SEM results reveals that the size and surface morphology of Nanoparticles.

KEYWORDS: Cerium Nitrate, Hydrothermal XRD, FTIR, UV-Vis, SEM.

AP61

Photo catalytic Method for Waste treatment using Reagent Titanium dioxide (TiO_2)

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Abstract

Titanium dioxide (TiO_2) as a photo catalyst has been ubiquitously studied for environmental applications. Though, readily available, nontoxic, and environmentally friendly; lower efficiency, less energy harvesting within the UV–Vis range with the ease of photo generated charge recombination is still a concern for its full-scale deployment as a photo catalyst for environmental remediation applications.In the light of this, this mini review considers heteroatom doping, dye/metal sensitization, metal oxide/ semiconductor coupling, hetero junction constructions, surface morphology regulation as well carbonaceous and other nano material hybrids for the improvement of TiO_2 photo catalytic activity performance efficiency in the removal of contaminants of emerging concern (CECs) from aqueous systems. As part of the plan to enhance industrial sustainability, reduce pollution, and deescalate global warming, solar energy has been a vital component hugely considered in heterogeneous photo catalysis. The studies of the use of semiconductor based- TiO_2 nano composites for the degradation of organic pollutant Most reported metal dopant ions have come from the transition metal, rare earth metal as well as noble metal groups . Mo^{5+}, W^{6+}, Cu^{2+}, V^{5+}, Cr^{3+}, Nb^{5+}, Zn^{2+}, Zr^{4+}, Mn^{2+}, Co^{3+}, Fe^{3+}, Y^{3+}, lanthanides (e.g., Ce^{3+}, Yb^{3+}, Nd^{3+}, Er^{3+}, etc.), and Au, Ag, Pt, Ru, etc.) Have all been reported as respective dopants source from these class of metals hetero junction structured semiconductor composites of type II configuration have been developed and reported for effective photo catalytic degradation of CEC compounds and bacteria inactivation building on the more efficient transmission and separation of charges by the composites.Beside inorganic semiconductor hetero junction composites, organic semiconductor components have also been used to realize type II hetero junction organic semiconductor-based composites and deployed for photo catalytic applications. Polyaniline (PANI) combined with ZnSe nano particles via simple and cost-effective co-precipitation method.The combination of a p-type semiconductor with an n-type semiconductor has generated p-n heterojunction semiconductors that have shown highly efficient photo catalyst character and therefore, making it a widely considered choice for photo catalyst composites for the degradation of organic pollutants.

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AP62

A Review on Materials for Optoelectronics Applications

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Abstract

Optoelectronics (or **optronics**) is the study and application of electronic devices and systems that find, detect and control light, usually considered a sub-field of photonics. In this context, *light* often includes invisible forms of radiation such as gamma rays, X-rays, ultraviolet and infrared, in addition to visible light. Optoelectronic devices are electrical-to-optical or optical-to-electrical transducers, or instruments that use such devices in their operation. Electro-optics is often erroneously used as a synonym, but is a wider branch of physics that concerns all interactions between light and electric fields, whether or not they form part of an electronic device.Optoelectronics is based on the quantum mechanical effects of light on electronic materials, especially semiconductors, sometimes in the presence of electric fields. Unlike other silicon based electronic devices optoelectronic devices are primarily made from III-VI semiconductor compounds such as GaAs, InP, GaN,GaP,GaSb,and their alloys since they are of direct band gap materials. Understanding the properties of these materials in the production of optoelectronic devices has been of critical importance. After the first demonstration in the early 1960s, of a semiconductor laser, optoelectronic devices have been developed in their millions, pervading our everyday lives in communications, computing, entertainment, lighting, and medicine.

Key Words: Optoelectronics, Quantum Wells, LEDs, Photo detectors, Solar cells.

AP63

GREEN SYNTHESIS OF SILVER NANOPARTICLES FROM *GYMNEMA SYLVESTRE & ZINGIBER OFFICINALE* EXTRACT AND ITS BIOLOGICAL ACTIVITY

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Abstract

The term "nanotechnology" refers to the creation, representation, manipulation, and use of structures through the control of shape and size at the nanoscale. Traditional chemical methods to medical and environmental technologies are only a few of the sectors where nanotechnology has successful applications. In addition, the green synthesis methodology for producing metal nanoparticles is a quick, environmentally friendly and nontoxic method. Nanotechnology is the science of creating, utilizing, and applying nanostructures or nanomaterials as well as examining how different material properties relate to their nanoscale dimensions. Utilizing the Silver Nitrate, *Gymnema Sylvestre* and *Zingibre Officinale* was synthesized AgNPs a Co precipitation assisted technique. Characterization of the AgNPs was carried out using SEM, TEM, XRD, IR and particles size analysis while their optical properties were examined with UV spectrophotometry.

Keywords: AgO, UV –Visible, XRD, FT-IR and Antimicrobial activity.

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AP64

APPARENT MOLAR VOLUME AND ACOUSTICAL STUDIES ON SODIUM GLYCOCHOLATE (SGC) IN WATER- APROTIC SOLVENTS MIXTURE AT 303.15K

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Abstract

Apparent molar volume (ϕ_V), apparent molar compressibility (ϕ_K) ultrasonic velocity (v) and absorption (α/f^2) studies have been carried out in aqueous solution of Sodium Glycocholate (SGC) containing 10%V/V of some aprotic solvent (namely Dioxane (DN) Tetrahydrofuran (THF), Dimethylsulphoxide (DMSO), Dimethyl formamide (DHF). The variation of apparent molar volume (ϕ_V), Velocity(v) in aqueous solution of Sodium Glycocholate containing 10%(V/V) of aprotic solvent with its concentration exhibiting a break at critical micelle concentration (CMC). The observed absorption $(\alpha/f^2)_{obs}$ increase with increasing SGC concentration and also exhibit a break at CMC similar to velocity curve. The results are discussed in terms of formation of micelles through hydrophobic interaction and hydrogen bonding.

Keywords

Sodium Glycocholate, Aprotic solvents, Apparent Molar volume, Acoustical properties , Micellization

AP65

DRUG DELIVERY APPLICATIONS OF RANDOM COPOLYESTERS POLY MANNITOL CO-AZELAIC CITRATE-HAp NANOCOMPOSITE

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ABSTRACT

The biomaterials produced using biodegradable polymers got huge consideration from the scientists. It gives admittance to biomaterials made of porcelain and metal, and it showed an extensive variety of mechanical, physiochemical, and corrupting properties. many arrogated methods of activity for further developing polymer attributes. The most widely recognized technique for making nanocomposites is the fuse of nanoparticles into polymer matrices. The capacity to control polymers' physical, synthetic, and natural attributes as well as the polymer's unimaginable limit with regards to nanoparticle retention are useful for prescription endorsement in medication. With the expansion of Aliphatic polyester with nanohydroxyapatite, they are mechanical strength essentially increments. The ongoing work included the blend of nano Hydroxy Apatite utilizing the Sol-gel technique and Poly [Mannitol-co-Azelaic Citrate] PMAC, a biodegradable aliphatic polyester, utilizing impetus free direct dissolve polycondensation. Utilizing the ultrasonication approach, a nano hydroxyapatite-polymannitol citrate polymer nanocomposite was made. By utilizing range examinations like FT-IR and further UV-apparent phantom examinations, which were additionally completed for the nanohydroxyApaptite and polyesternano composite, it was feasible to distinguish biodegradable polyester and its nano composites. About the nanocomposite's and polyester's morphology and crystallinity, powder XRD and SEM examination gives clearness. The polyester nano composite was stacked with a foreordained measure of an economically accessible prescription, and the medication delivering capacity was assessed.

Keywords: Sorbitol based polymers, Biodegradable Polymers, Aliphatic Polyesters.

AP66

Solvothermal synthesis was employed to prepare SnS-modified $Sn_xMn_{1-x}S+Bivo_4$ heterojunction photo catalysts for achieving highly efficient visible-light-driven H_2 production.

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Abstract

The development of low-cost, highly efficient, and stable solid solution photo catalysts based on SnS holds significant importance for the advancement of photo catalytic H_2 production. The well-engineered carbon shells offer durable protection to SnS nanocrystals via C-S covalent bonds, shielding them from electrolyte corrosion and structural pulverization. The crystal structure, composition, morphology, and properties of the prepared samples were analyzed using X-ray diffraction (XRD), scanning electron microscopy (SEM), UV-visible spectroscopy (UV-vis), and X-ray photoelectron spectroscopy (XPS). The properties of SnS can be improved through doping or forming nano composites with appropriate metals, these approaches have been relatively underexplored. Here, we describe the synthesis of $Sn_xMn_{1-x}S+Bivo_4$ nano composites via a Solvothermal method using SnS, $Bivo_4$ and $Sn_xMn_{1-x}S+Bivo_4$ precursors, and investigate their photo catalytic activity.

Keywords: $Sn_xMn_{1-x}S+Bivo_4$ solution; Heterojunction; Nanorod; SnS cocatalyst; Hydrogen evolution visible-light-driven photo catalysts, solvothermal method, RhodamineB (RhB).

AP67

SYNTHESIS AND CHARACTERIZATION OF DOPED Cu^{2+}-Bi_2O_3 NANOPARTICLES AND IT'S ANTIBACTERIAL ACTIVITY

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Abstract

In the present work, a pure and copper doped bismuth oxide nanoparticle has been successfully synthesized by a chemical precipitation method. The synthesized nanoparticles were characterized by XRD, FT-IR, UV-Vis, PL, SEM-EDAX, HR-TEM and Antibacterial Activity. In XRD results indicated that Cu was incorporated into the framework of the α-Bi_2O_3. The XRD patterns of α-Bi_2O_3 and Cu-doped α-Bi_2O_3 has tetragonal structure. The SEM characterizations revealed rod shape microstructures of the pure Bi_2O_3 sample, while the Cu-doped product consisted of distorted or broken rod microstructures. The elemental status of pure and Cu-doped Bi_2O_3 NPs were studied by EDAX. FT-IR studies which gives the physical and chemical structure of the material. The UV light absorption is observed in the range 200-800 nm. It confirms its optical property and the sharp peak at 382 nm. The PL spectra shows that the emission peaks of pure and Cu-doped Bi_2O_3 nanoparticles at 435 nm in blue region and 475 nm in violet-green region were observed. Furthermore, the antibacterial activities against Escherichia coli were studied.

Keywords: Bi_2O_3nanoparticles, Cu-doping, Structural studies, Morphology, Antibacterial Activity.

AP68

STRUCTURAL, MORPHOLOGICAL AND HUMIDITY SENSING STUDY OF ZINC DOPED TITANIUM DIOXIDE PREPARED BY MICROWAVE ASSISTED SYNTHESIS

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Abstract

Nanocrystalline pure and zinc doped titanium dioxide (TiO_2) powder was synthesized through microwave assisted synthesis using citric acid as a fuel.. Prepared samples were characterized by X-ray diffraction (PXRD), field emission scanning electron microscope (FESEM), and Humidity Sensor study. The PXRD analysis revealed the tetragonal structure. The grain size was estimated using Debye-Scherrer equation and Williamson-Hall method. The cell parameters were found using Rietveld refinement. The FESEM pictures showed the formation of agglomerated nanoparticles. The sample prepared was tested for its humidity sensing performance in the relative humidity (RH) range of 24 % to 97%.

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AP69

Exploring the Role of Rietveld Refinement and Phase Matching in the Photocatalytic Behavior of Rare Earth Orthoferrites

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Abstract

The organic dye methylene blue has been effectively degraded under ultraviolet and visible light due to the semiconducting properties of the synthesized composite. The orthorhombic structure of the cerium composite was confirmed through Rietveld refinement analysis using the MATCH software. This structure resulted from the uneven heating during the microwave-assisted synthesis, which involved an 800-watt power supply for 30 seconds followed by 12 cycles. Additionally, phase matching in the Rietveld analysis confirmed the presence of iron in a specific region of the composite. The correlation between the refined bond lengths and the observed values was further supported by fingerprint absorption peaks at approximately 560.36 cm^{-1} and 542.38 cm^{-1}. The thermal analysis curve, particularly the fourth step, indicated the occurrence of oxidation in the TGA analysis.

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AP70

Spectroscopic Analysis, Molecular Structure and Drug Likeness on Thione Compound – Biological Assay

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Abstract

Thione Derivative has been synthesized and characterized. In this study, the compound was analyzed through computational methods and compared its spectroscopic analysis with the experimental data. The optimized structure of the titled compound is analyzed with its maximum stability and minimum energy is obtained using Gaussian 09w. The compound's experimental and computed electronic excitation state were analyzed using UV-Vis's spectra with different polar solvents, with the basis setTD-DFT method. HOMO and LUMO energy levels were analyzed to check the stability. The NBO and NLO analysis was undertaken. MEP is used to analyze the molecular structure of the titled compound and a 3D map is determined. The final process of this research is to use computational molecular docking with the Auto Dock tool to identify the greater protein-ligand interaction energy and other biological parameters for the targeted proteins of redox homeostasis and thus the titled compound possesses the maintenance of many cellular processes.

Keywords: HOMO-LUMO; NBO; NLO; polar solvents; In-Silico biological assay

AP71

ADVANCING THE STRENGTH AND DURABILITY OF NANOCOMPOSITES THROUGH HYBRID NANOMATERIALS: A COMPREHENSIVE STUDY

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Abstract:

In the quest to enhance the mechanical properties and longevity of structural materials, the integration of nanotechnology into composite materials has emerged as a promising solution. This study investigates the synergistic effects of hybrid nanomaterials—specifically, a combination of carbon nanotubes (CNTs) and graphene oxide (GO)—on the strength and durability of polymer nanocomposites. By systematically varying the ratios of CNTs to GO and incorporating them into a polymer matrix, we examine the impact on mechanical performance, thermal stability, and resistance to environmental degradation. Advanced characterization techniques, including scanning electron microscopy (SEM), atomic force microscopy (AFM), and mechanical testing, reveal significant improvements in tensile strength and impact resistance. The hybrid nanocomposites exhibit enhanced thermal conductivity and reduced thermal expansion, highlighting their potenti al for high-performance applications. Furthermore, the study provides insights into the mechanisms by which these hybrid materials reinforce the polymer matrix, offering a pathway to the development of next-generation nanocomposites with superior mechanical and thermal properties. This research paves the way for innovative applications in aerospace, automotive, and construction industries, where advanced materials are critical to performance and safety.

Keywords: Nanomaterials, Synthesis, Characterization, SEM & AFM Techniques

AP72

SYNTHESIS AND CHARACTERIZATION OF ZINC DOPED CERIUM OXIDE NANOPARTICLES BY CO-PRECIPITATION METHOD

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ABSTRACT

Undoped and Zn doped CeO Nanoparticles were synthesized using co-precipitation method. ZnO is the formula for the inorganic compound zinc oxide. It is an insoluble white powder in water. Zinc oxide, or zinc oxide, can be found in the crust of the Earth. The obtained samples were characterized by (XRD), (FTIR), (SEM), (EDS) and (UV-VIS). The XRD analysis indicates that the synthesized nanoparticles have the tetragonal structure. Cerium oxide may conduct oxygen ions at high temperatures because it has ionic conductivity. Its usage in oxygen sensors and solid oxide fuel cells is made possible by this characteristic. The surface morphology of synthesized materials was investigated by using SEM. The compositions were confirmed by EDS. The other properties were analyzed by FTIR and UV-VIS Spectroscopy.

Key words: CeO2 Nanoparticles, co-precipitation, XRD, FTIR, SEM, EDS, UV-VIS.

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AP73

SYNTHESIS, CHARACTERIZATION AND OPTICAL PROPERTIES OF Co_3O_4 BY PRECIPITATION METHOD

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ABSTRACT

Cobalt oxide Nanoparticles were prepared by a simple precipitation method. The samples have been studied by various techniques such as X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Fourier transform of infrared spectroscopy (FTIR) and (UV-vis) absorption spectra of characterization techniques. X-ray analysis showed the cubic structure of cobalt oxide. SEM shows the morphology of nano particles. The band gap energy of the nano particles is found by UV-Vis spectroscopy. Functional groups were identified by Fourier transform infrared spectroscopy.

Keywords: Cobalt oxide Nanoparticles, precipitation method, XRD, UV-VIS, FTIR, SEM

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AP74

Cultivate Oyster Mushroom With The Help Of Spawn

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Abstract

Oyste**r** mushroom (Pleurotus ostreatus) are a valuable and versatile species With a wide range of application. Our research has demonstrated their potentialin [specific area of research , e.g., food security, environmental sustainability medicinal application]. The unique characteristics of oyster mushroom, including their ability to grow on a variety of substrates and their nutritional profile, make them an attractive option for [specific industry or field]. Healthy Benefits Of Oyster Mushroom is Maintain The Levels Of Blood Sugar. Enhance Immunity System. Improve Cardiovascular Condition.Treat Skin Problem. Source Of Several Vitamin in mushroom is Riboflavin (vitamin B2) ranging from 1.8 – 5.1 mg /100 g DW. Niacin (vitamim B3), ranging from 31- 65 mg /100 g DW. Oyster mushroom are often seen as a symbol of renewal , growth ,and transformation. Their ability to thrive in unexpected places, like on decaying trees, can be interpreted as finding beauty and opportunity in unlikely circumstances. In some culture , they represent good luck and prosperity .Overall, they're a reminer to embrace change and find beauty in the unexpected.

Keywords:Riboflavin,Niaci

AP75

Effect of Mn concentration on Synthesis and Optical properties of ZnS nanoparticle

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Abstract

Pure and Mn^{2+} doped ZnS nanoparticles were synthesized by chemical co-precipitation method using Poly Vinyl Pyrrolidone (PVP) as caping agent (stabilizer). The structural and optical properties of pure and Mn^{2+} doped ZnS nanoparticles were examined by X-ray powder diffraction(XRD), scanning electron microscopy(SEM), EDAX, Transmission electron microscopy(TEM), UV-Vis absorption and photoluminescence spectroscopy(PL). The XRD pattern reveals that pure and Mn^{2+} doped ZnS nanocrystallities in cubic nature and size of the nanoparticles lies in the range of 2-3 nm. The SEM micrographs shows that pure and Mn^{2+} doped nanoparticles are in spherical nature. The EDAX Spectra reveal that the chemical compositions pure, and doped samples are incorporated into ZnS lattice. The sizes of the nanoparticles obtained from TEM (2-3 nm) are well matched with XRD analysis. The optical absorption spectra show blue shift for pure ZnS and Mn^{2+} doped ZnS nanoparticles when compared with bulk ZnS. Photoluminescence spectra (PL) exhibit blue, yellow–orange emission peaks for pure and doped samples with excitation wavelength of 330 nm.

Keywords: ZnS nanoparticles, XRD, PL, SEM with EDAX, TEM, HR-TEM and absorption.

AP76

Synthesis and Characterization of Bismuth based nanocomposites to boosting the photocatalytic activity for environmental remediations

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Abstract

Bismuth based nanocomposites were prepared by hydrothermal synthesis and direct thermal decomposition method. The as prepared nanomaterials were characterized by various analytical techniques such as X-ray diffraction (XRD), Field emission scanning electron microscopy (FESEM), Ultraviolet–visible diffuse reflectance spectroscopy (DRS), Fourier transform infrared spectroscopy (FT-IR) and Photoluminescent spectra for structural, morphological and optical properties. The photocatalytic performance of materials was carried out in the presence of visible light irradiation by using most harmful Rhodamine B dye. The $BiVO_4$/g-C_3N_4 composites were showed the higher photocatalytic performance than the pristine materials. The improved performance of $BiVO_4$/g-C_3N_4 was mainly attributed to the synergistic effect between the interface of $BiVO_4$ and g-C_3N_4 including enhanced optical absorption in the visible region, enlarged specific surface area and the suitable band positions of $BiVO_4$/g-C_3N_4 composite. Based on the photocatalytic performance of the $BiVO_4$/g-C_3N_4 nanocomposites were potential and promising material for degradation of the organic pollutants.

Key words: Bismuth vanadate, photocatalytic performance, visible region, synergistic effect

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AP77

Synthesis and Antidiabetic Studies of ENND44MPIMA Crystals

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Abstract

The ENND44MPIMA - (E)-N,N-Diethyl-4-{[(4-methoxyphenyl) imino] methyl} aniline crystal is grown by slow evaporation solution growth method at room temperature in a period of 2 weeks. The chemical formula is $C_{18}H_{22}N_2O$. the system is triclinic with the space group as $P\bar{1}$, the lattice parameter value are a= 8.3833Å, b=9.2877Å, and c=11.2982Å, with α=78.991°, β= 71.008°, γ= 74.177°. Though the material is said to be centro-symmetric it exhibits second order NLO of 1.01 times that of KDP as the value. The antidiabetic representation of α-amylase and α-glucosidase of ENND44MPIMA crystal with IC50 of 81.05 for α-amylase and 85.84 for α-glucosidase as the IC50 values in microgram/millilitre.

Keywords: ENND44MPIMA, α-amylase, α-glucosidase, NLO.

AP78

Heterostructure-induced interfacial charge transfer interaction in CoS/CoO @activated carbon as a bi-functional electrocatalyst for water-splitting application

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Abstract

Recently, the green synthesis of electrocatalysis along with earth abundant resources noble metal free and low-cost materials open a wide window for water splitting application. Particularly, the bi-functional electrocatalytic material have potential for both hydrogen evaluation reaction (HER) and oxygen evaluation reaction (OER) in the alkaline medium. In the present investigation, the cobalt sulfide/oxides hangered on the activated carbon nanosheets (CoS/CoO/AC) were synthesized through the hydrothermal and then the carbonization process. The X-ray diffraction peaks observed in the CoS/CoO/AC nano composites revealed the presence of CoS, CoO and activated carbon peaks which confirmed the formation of heterojunction in the binary .The CoS/CoO@AC nanocomposite showed the small pebbles like particles (CoS/CoO) hangered on the sheet like morphologies of activated carbon nanosheets .Further, the BET analysis of CoS/CoO@AC nanocomposites revealed an enhancement of the surface area of about 1038.57 m^2/g along with the pore size and pore volume of 3.23 nm and 0.442 cc/g, respectively, of the CoS/CoO@AC nanocomposites. The electrochemical water-splitting analysis of CoS/CoO/AC, as a bi-functional catalysis which revealed the low over potential for both the HER and OER analyses at about -0.266 and 0.2654 V vs. RHE, respectively in the alkaline medium.

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AP79

Nanobiotechnology Application for Fabricating Metallic Nanoparticles in Marine Drug Development and Potential Antimicrobial Activity

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ABSTRACT

Nanotechnology is one of the leading scientific fields today since it combines knowledge from the fields of Physics, Chemistry, Biology, Medicine, Informatics, and Engineering. It is an emerging technological field with great potential to lead in great breakthroughs that can be applied in real life. Significant applications of nano sciences and nanoengineering lie in the fields of pharmaceutics, cosmetics, processed food, chemical engineering, high-performance materials, electronics, precision mechanics, optics, energy production, and environmental sciences. Nanomaterials with unique properties such as: nanoparticles carbon nanotubes, fullerenes, quantum dots, quantum wires, nanofibers, and nanocomposites allow completely new applications to be found. Products containing engineered nanomaterials are already in the market. Medicinally it is worthy to using nanomaterials for a range of antimicrobial applications in agriculture and medicine. Biomaterial Products obtained from plants have been used in medicine for many years. These plant biomaterials derived compounds have shown as prospective therapeutic agents against microbial infection, cancer, inflammation, and other diseases. Biomaterials obtained from the biological systems such as plants, marine algae, fungi etc., are considered as biomtics for the synthesis of nanostructured biocompatible medicines. The dried ***Ulva lactuca*** were made into nano-powder by grinding a high energy process. The aim of this work is to outline the therapeutic potential of

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biomaterials derived from plant ***Ulva lactuca*** inhabited in marine resources. The dried plant were made into nanosized powder by High energy ball milling. It is a typical top-down technique of nanomaterial preparation. The prepared bio-nanomaterial characterized by using UV-vis spectroscopy, XRD, SEM, TEM, and FT-IR technique. Further, this work aims to afford a therapeutic qualities of bio-nanomaterial against pathogenic microbes.

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AP80

SYNTHESIS AND SYSTEMATIC INVESTIGATION OF STRUCTURAL AND OPTICAL PROPERTIES OF MAGNESIUM (MgO) NANO STRUCTURES

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Abstract

We have successfully prepared MgO nanocrsystalline with nanoplatelets and nanorods shaped morphology via a facile sol gel method. Powder X-ray diffraction analysis showed that the nanostructures consisted of cubic-phase MgO. When PEG and oxalic acid and were added to the reaction system. A considerable red shift in the absorption edge and decreasing the band gap was observed for nanosheets of MgO. This method can be easily scaled up to produce high surface area with desired morphology and is expected to be a promising industrial production process of MgO for different catalytic and separation processes. The results obtain in the present work confirms the Mn doped samples increase the mobility of charge carriers, and also may find possible potential applications in high performance gas sensor devices.

Keywords: MgO, PEG, Oxalic Acid, Nanosheets.

AP81

Effect of CNT's incorporated on Co(OH)2 nanocomposites for Supercapacitor Applications

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Abstract

supercapacitor electrodes with superior energy storage properties were successfully fabricated by the direct growth of Co(OH)2/MWCNT hybrid nanocomposite over Ni foam. The metal hydroxide nanocomposite electrode exhibited a maximum specific capacitance of 1911 Fg^{-1} at 1 Ag^{-1}. The supercapacitor electrode had remarkable cyclic stability with capacitance retention of 96.5% at 1 Ag^{-1} after 10000 continuous GCD cycles. The 3 M KOH//Co(OH)2/MWCNTS//AC ASC device demonstrates a high energy density of 89.3 Wh kg^{-1} at 1 Ag^{-1}. More impressively, the device still remains a energy density of 55.5 $Whkg^{-1}$ is achieved at an power density of 1015 Wkg^{-1}. The superior pseudo-capacitive properties are attributed to the unique bud morphology for large surface to volume and high electrochemical activity. The study proves that the direct growth of active materials over conducting substrate is a promising approach for the fabrication of high-performance supercapacitor electrodes.

Keywords: GCD, KOH, Nano composite, SEM.

AP82

Effect of Manganese (Mn) dopant on structural, optical and electrical properties of ZnO nanoparticles

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Abstract

In summary, pure and Mn doped ZnO nanoparticles were prepared by simple chemical precipitation method. Powder XRD results suggest that both pure and Mn doped ZnO nanparticles have hexagonal wurtzite type structure and the results are good in agreement with the standard JCPDS (card no. 89-1397) data. Spherical shaped morphology and average diameter of around 28-21 nm was observed by SEM micrograph. A considerable red shift in the absorbance edge and decreasing band gap energy from 3.73 eV to 3.53 eV conformed by UV-Vis transmission spectra. Moreover optical properties of ZnO have significantly improved by Mn doping, which is confirms the PL spectra analysis. The results obtain in the electrical measurements confirms the Mn doped samples increase the mobility of charge carriers, and also may find possible potential applications in high performance gas sensor devices.

Keywords : XRD, Mn, ZnO, SEM.

AP83

Interconnected Sheet-Architectural $Ni(OH)_2$ Deposited Onto CNT-Based Ni Foam Substrates

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ABSTRACT

we have created a 3D honeycomb porous $Ni(OH)_2$@CNT supercapacitor, assembled from cross-walled and interconnected sheet-architectural $Ni(OH)_2$ deposited onto CNT-based Ni foam substrates. With this unique architecture, the device shows high gravimetric specific capacitance of 1715 Fg^{-1} at 1 Ag^{-1}, a comparable energy density of 77.2 $Whkg^{-1}$ and power density of 866$kWkg^{-1}$, excellent cycling stability of ~94.4% capacity retention and high Columbic efficiency of 84.5% after 5000 cycles, indicating the electrodes may have promising potential for high-performance supercapacitors. Furthermore, the α-$Ni(OH)_2$@/CNT electrode has a lower charge transfer resistance than pristine $Ni(OH)_2$. This lower charge transfer resistance may be due to the increase in the reaction surface area and electrical conduction of the composite electrode caused by the CNTs. For practical application of the asymmetric supercapacitors, all kinds of LED lights can be lighted up by two series asymmetric supercapacitors. Benefited from its unique microstructures, synergic effect was exerted between individual components in the composite, resulting with highly reversible capacitance, excellent cycling stability and good rate capability. Moreover, the composite was synthesized via a scalable one-pot hydrothermal fabrication procedure, which can be extended to other active materials for future supercapacitor electrodes.

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AP84

Strctural And Electro Chemical Poperties Of α-Mns Nano Flakes Synthesized By Hydrothermal Method

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Abstract

Manganese acetate was purchased from Sigma Aldrich. Thiourea and potassium hydroxide (pellets) were obtained from Global Scientific Company, Erode. Dtech Solutions, Uttar Pradesh supplied nickel foam (NF). The NF (1 cm x 3 cm) was cleaned with 3 M HCl, ethanol, and deionized (DI) water to remove the surface's impurities and oxide layer. All chemicals in this study were used as received, and all solutions were prepared with deionized water.α – MnS nano flakes were synthesized using a facile hydrothermal approach. The crystalline phase structure was examined by X-ray diffraction analysis. By using FESEM analysis, the morphological structure was investigated and also its elemental composition was confirmed by XPS studies. The α – MnS nanoflake electrode showed a high specific capacitance of 486 F/g at a current density of 1 A/g with good rate capability. These results highlight the potential of economically synthesized α – MnS nanoflakes electrode has great potential for energy storage applications.

Keywords: MnS, MHCL, XPS, Nanoflakes.

AP85

Crystal growth, vibrational,thermal, optical,nmr and theritical study of nonlinear optical material

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Abstract

An organic single crystal of 2-methyl 3,5-Dinitro benzoic acid have been grown successfully by slow evaporation solution growth method. Powder XRD analysis discloses that the grown crystal crystallizes in monoclinic system and the crystal is stabilized through hydrogenbonds. The results obtained from Hirshfeld surfaces are suitable for assessing the efficiency of force fields. The vibrational nature of the functional group present in the molecule is investigated by analyzing the vibrational spectrum. The UV–Vis–NIR absorption spectrum confirms the transparency nature of the crystal in the range of 300 to 1100 nm and the energy gap value of the grown crystal is 4.14 eV. The frequency conversion efficiency of the grown crystal is 0.8464 times greater than that of KDP and 0.524 times that of urea. Both the conversion efficiency and transparency character of the crystal confirms the suitability of the material for optical applications. Experimentally obtained ^{1}H and ^{13}C NMR chemical shifts are compared with theoretically computed values. The calculated HOMO and LUMO energies authenticate the charge transfer occurs in the molecule when it is excited.

Keywords: Powder XRD, UV-Analysis,KDP,HOMO-LUMO.

AP86

PREPARATION AND CHARACTERIZATION OF COPPER OXIDE NANO PARTICLES BY PRECIPITION METHOD

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Abstract

The copper oxide (CuO) nanoparticles were prepared by precipitation method. The structural, optical and morphological properties of resultant nanostructures were studied by X- ray diffractometry (XRD), FTIR and UV - Vis Spectrometer and scanning electron microscopy (SEM). The XRD analysis revealed all the reflection peaks in the pattern were readily indexed to the monoclinic structure of the CuO. No characteristic peaks of impurities were observed,indicating the high purity of the products. The average crystallite sizes of the samples were calculated as 35, 33 and 25 nm respectively. The presence of the strong peaks at 525 and 596 cm-1 are well matched with the stretching vibrations of the Cu–O bonds. The band gap energies of the CuO samples were calculated as 1.80, 1.85 and 2.0 eV, respectively. The morphological investigations of SEM confirmed the morphologies of the particles synthesized in different solvents are approximately spherical, with the average particle size varying between 25-35 nm.

Keywords: SEM, Diffractometer, FTIR,UV-Analysis, CuO.

AP87

Biosynthesis Of Cuo Nanoparticles Using Makrut Lime Peel Extract for Electronic Application

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Abstract

In recent days Electronics applications have gained attraction in the Biosynthesis of metallic nanoparticles due to their cost-effectiveness, simple preparation steps, and environmentally-friendly. The wet chemical process of extracting peels from citrus fruits, namely Makrut lime or Kaffir Lime (Citrus hystrix), is a simple, effective, and eco-friendly way to synthesize copper oxide nanoparticles (CuO NPs). Green synthesised CuO/ML nanoparticles were created, and their structural, optical, and electrical characteristics were confirmed using X-ray diffraction, scanning electron microscopy, EDAX, and UV-visible spectroscopy, as well as FTIR. The XRD investigation verified that the CuO/ML nanoparticles have a hexagonal crystal structure of wurtzite and calculated the Size of CuO/ML nanoparticles. Additionally, CuO/ML nanoparticle surface morphologies and structure were examined by SEM analysis. The electrical and optical characteristics of the as-synthesised CuO/ML nanoparticles were assessed using UV-visible spectroscopy. Electrochemical CuO/ML electrode investigations were carried out Using Cyclic Voltammetry, Galvanostatic Charge-Discharge, And Electrochemical Impedance Spectroscopy. Cyclic Voltammetry and Charge-Discharge analysis of CuO/ML confirmed the pseudocapacitive behavior that appeared in the redox peak behavior. The prepared material shows better electronic and optical properties due to its green synthesis approach. Finally, this way of approach to synthesised CuO/ML nanoparticles will be suitable for various electronic applications and environmentally friendly.

Key words: Copper oxide, Green synthesis, Kaffir Lime/ Makrut lime, Pseudocapacitor

AP88

Preparation and Characterization of a novel Cu substituted $CoMn_2O_4$ spinel for the photodegradation of azo dye pollutants

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Abstract

Semiconductor based nanostructured materials for solar photocatalytic process has been shown to be energy effective and degradation of unwanted pollutants at present in the industry waste water . In this study as preparation of a novel Cu substituted $CoMn_2O4$ by co-precipitation routs its activity by photodegradation such as azo dye pollutants (Naphthal green and methyl violet) under UV and Visible light irradiation electrocatalytic activity in methanol oxidation and self-cleaning properties. The as prepared $Cu/CoMn_2O4$ was characterized by XRD, , FE-SEM, FT-IR, HR-TEM, XPS, UV-DRS and PL spectroscopy . The SEM morphology indicate the formation of nanoparticles in the range of size 20-50 nm. The results suggested that Cu substituted $CoMn_2O4$ which notably the final photocatalytic performance of the system. Cu spinel possesses high reusability without appreciable loss of activity up to four runs significant hydropobicity of Co/spinel indicates its self cleaning property.

Key words :

Hydropobicity , Photodegradation , Photocatalytic,Semiconductor

AP89

Crystal structure, DFT, Docking and Biological activity studies of Small Organic Molecule

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Key words : amine, anticancer, DFT , antimicrobial.

Abstract :

The small organic molecule based on Aniline was characterized using. Single crystal X-ray diffraction confirms that the title compound crystallizes in a orthorhombic crystal system. The unusual C-H... π interaction facilitate the crystal packing proved by the Density Functional Theory (DFT) and Hirshfeld surface analysis. The molecule showed an excellent result against Bacillus susbtilis with the value of 25 µg/ml. The antioxidant behaviour of the molecule showed strong antioxidant property. The silico docking studies on breast cancer cell line MCF-7 protein confirms that the molecule showed excellent binding affinity value of -4.5 kcal/mol. The in vitro anticancer studies on the breast cancer cell line MCF-7 showed promising results.

AP90

REVIEW OF ACETIC ACID AS A CATALYST

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Abstract

Generally, Now acetic acid widely used as a catalyst. Heterocyclic compounds are having hetero atom of Nitrogen, Sulphur and oxygen. Thiazole compound have two different hetero atoms. So, this family produced several compounds which have interest in terms of the synthetic chemistry. Several reactions were now uses acetic acid as a catalyst. The uses of acetic acid have several advantages like easily separate, Reaction is very fast, High boiling point, Low cost, etc. Therefore acetic acid can be a good contribution for addition reaction.

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AP91

Facile synthesis of core-shell nano particles $CoFe_2O_4$@$SiO_2$and enhancement of photocatalytic properties

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Abstract

Facile synthesis of $CoFe_2O_4$@SiO_2 is achieved via three steps of sol-gel auto combustion, co-precipitation and sol-gel nitrate-citrate route. Powder XRD patterns of the samples confirmed its phase purity and structure respectively. Average crystallite sizes of the sample exhibit the particles were at nano range of 35.4 nm. SEM images of the sample show different size and shape of the particles and aggregation due to SiO_2 coating. Crystallite sizes were in nano scale and in good agreement with powder XRD results. EDAX spectra of the samples have confirmed the purity of the sample prepared in each stage and well agreement with atomic weight percentage which was shown that the double coating of $CoFe_2O_4$ with SiO_2. Particle size analysis is also supported average particle size of sample. From zeta potential analysis, It is clearly seen that the stability of the collaidal suspension. Optical absorbance measurements over the range 200-800 nm show the increased wavelength from 225 nm – 270 nm and in the wavelength range from 270-650 nm, the absorbance of the visible and NIR light constant or nearly flat band and decreased to 800 nm. This postulate is further supported considering that photocatalyic acitivity be studied at range of 600 – 700 nm. The photocatalytic activity is investigated by UV-visible light absorption of the methylene blue dye solution which is pollutant model. The photocatalytic degradation efficiency is achieved to 75 % in 60 minutes. The band gap value is calculated as 4.15 eV using Tauc's equation.

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AP92

Synthesis, crystal structure and biological activity of piperazine based organic molecule

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Abstract

A small organic molecule based on piperazine is prepared using microwave techniques. Single crystal X-ray diffraction confirms that the title compound crystallizes in a monoclinic crystal system with space group of P 21/n. The molecule showed an excellent result against Bacillus subtilis with the value of 6.25 µg/ml. The antioxidant behaviour of the crystal (piperazine) showed strong antioxidant property. The in vitro anticancer studies on the breast cancer cell line MCF-7 showed promising result.

Keywords : piperazine, single crystal, anticancer, antimicrobial.

AP93

COMPARITIVE STUDY OF ELECTRICAL PROPERTIES OF MAGNETIC NANO MATERIALS OF PURE AND DOPED LITHIUM COBALT FERRITE FOR LITHIUM ION BATTERIES

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Abstract

The Lithium Cobalt ferrite without and with rare earth element Lanthanum has synthesized by solgel method and the structural, morphological and dielectric properties of the synthesized material has investigated thoroughly using standard experimental techniques like XRD, VSM, FESEM-EDAX mapping and impedance analysis. The remarkable features of the soft alkali metal Lithium like extremely reactive nature leaves a way to tremendous applications in electrochemistry, when it is added with ferrite, the conductivity of the material may still increase. However, Ferrites can offer maximum conduction, Cobalt also substituted to transform the soft pure lithium ferrite into magnetically effective material.In the mean while rare earth element Lanthanum is doped and comparative study is performed. The development of cubic structure was confirmed from X-ray diffraction analysis belongs to the space group Fd-3m along with this alpha, beta, gamma values, peak list, stick pattern and volume of the cell about 590.99 cm^3 for LCF and 302.48 is calculated for LCLF. VSM shows that all the synthesized materials are soft magnetic, (M_r/M_s) squareness ratio of all the compounds are below 0.5 and it implies that the formed compounds are multi domain magnetic particle used in various applications involving transformer coils and cores with reduced inductance. The morphology and chemical composition of the composite were obtained in FESEM and EDS mapping analysis. The dielectric parameters for both the compounds have been investigated through impedance analysis which shows LCF improvement is more than LCLF in electrical conductivity, underscores the multifunctional nature of the synthesized material, potentially making it useful in various applications requiring both magnetic and dielectric properties.

Keywords: Nanostructured, Solgel method, Magnetic measurements, FESEM mapping, dielectric response.

AP94

Synthesis and Characterization of Nd^{3+} substituted $BiFeO_3$ perovskite nanoparticles

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Abstract

Nd^{3+} substituted $BiFeO_3$ perovskite nanoparticles were prepared via the combustion method. XRD analysis indicates a single-phase perovskite and orthorhombic crystal system. However, an increase in Nd^{3+} doping fraction (x = 0.15 and 0.25), while small impurity peaks were observed, which indicates that α-Bi_2O_3 monoclinic phase. The average crystallite size was in the range of 13.93 to 16.71 nm. The elements and oxidation state were confirmed by the XPS study. With an increase in Nd^{3+} concentration, the direct band gap as determined by UV-DRS reduced from 2.11 to 2.05 eV. The surface morphology showed the formation of nanosized grains with pores. The PL spectra exhibited emission patterns in the ultraviolet and visible areas as a result of the defect centers functioning as trap levels.

Keywords: Perovskites; Combustion technique; Nd-doped $BiFeO_3$, Surface Chemistry;

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AP95

Green synthesis, optical and magnetic properties of emerging Zinc Oxide and Calcium doped ZnO nanoparticles

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Abstract

Employing a green synthesis technique, we produce cost-effective zinc oxidenanoparticles and calcium-doped zinc oxide nanoparticles by utilizing Citrus sinensisfruitextract as an efficient reducer and encapsulating agent.XRD analysis confirmed a hexagonalwurtzite structure in the synthesized nanoparticles. Oxidation states and quantification of theelement on the surfaces of pure and Ca doped ZnO was achieved through XPS investigations.Nano flakes structures of the synthesized samples are prominently depicted in the HR-SEM image, providing visual insight into their morphology.The elemental analysis and their quantity were discerned using EDX spectrum, while the Raman spectra exhibited characteristic signals in the low wavenumber range, specifically at 341 and 346 cm -1 , corresponding to the difference E 2 high -E 2 low in 2 nd order Raman modes.Estimation of direct band gaps utilizing Tauc plotyielded values of 3.27 eV for ZnO and 3.01 eV for Ca doped ZnO. Furthermore, the presence of oxygen and zinc vacancies was evidenced by the observation of various bands in the photoluminescence spectra.From TG analysis, ZnO and Ca doped ZnO samples exhibited weight losses of 5.6% and5.8%, respectively. Moreover, Magnetization–Field (M–H) hysteresis curves demonstrateddiamagnetic behavior at room temperature.

Keywords: Zinc oxide; Optical behavior; Magnetic properties; Raman spectrum;

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AP96

Effect of Al doped $MgFe_2O_4$ spinel nanoparticles: structural, optical and magnetic behavior

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Abstract

Nanoparticles (NPs) of $MgAl_xFe_{2-x}O_4$ ($0 \leq x \leq 0.5$) were synthesized using the combustion method. The XRD pattern clearly indicates the structural formation of pristine $MgFe_2O_4$ nanoparticles. The size of the crystallites ranged from 34 to 45 nm. The synthesized nanoparticles displayed a spherical morphology as observed in the FE-SEM images. The presence of magnesium, iron, and oxygen elements, as well as doped aluminum, has been confirmed through EDX spectra analysis. The band gap was determined to be between 2.03-2.13 eV through diffuse reflectance spectroscopy. The wavenumbers of the vibrational spectra have been confirmed for magnesium ferrite.

Keywords: Combustion method; L- arginine; Al doped $MgFe_2O_4$; Structural properties, Optical properties; Magnetic properties

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AP97

Magnetic and optical characteristics of $MgFe_2O_4$ and $MgFe_{2-x}Bi_xO_4$ nanoparticles synthesized by combustion

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Abstract

The $MgFe_{2-x}Bi_xO_4$ (x = 0.0, 0.1, 0.3 and 0.5) nanostructures were synthesized using a combustion technique. The analysis revealed a cubic spinal structure. Crystallite size was calculated using Debye Scherrer's formula. FT-IR showed that there are absorption peaks at 561, and 434 cm^{-1}indicating interaction between metal and oxygen at octahedral and tetrahedral points in the structure. UV-VIS analysis showed a band gap energy of 1.78-1.94 eV. FE-SEM images showed an irregular grain size distribution. The EDX and elemental mapping analyses confirmed the presence and distribution of Bi, Mg, Fe and O elements. Pure and Bi-doped $MgFe_{2-x}Bi_xO_4$ samples have magnetic characteristics, with high coercivity and magnetic saturation values at x = 0.3, making them suitable for a wide range of technical applications. The hysteresis loops yield several magnetic parameters, including saturation magnetization (Ms), remanence (Mr) and coercivity (Hc).

Keywords: Combustion method; L-arginine; Bi-doped $MgFe_2O_4$; Structural properties, Optical properties; Magnetic properties.

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AP98

SYNTHESIS AND CHARACTERIZATION OF PURE AND SILVER DOPED TIN OXIDE NANOPARTICLES

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ABSTRACT

Tin oxide (SnO_2) nanoparticles have garnered significant attention in recent years due to their exceptional electrical, optical, and sensing properties, making them suitable for various applications such as gas sensors, photo catalysts and optoelectronic devices. However, their performance can be further enhanced by doping with noble metals like silver. Silver-doped tin oxide (Ag-SnO_2) nanoparticles exhibit improved electrical conductivity, enhanced visible light absorption, and increased gas sensing performance compared to their undoped counterparts. In this study, silver-doped tin oxide nanoparticles were successfully synthesized by co-precipitation method. The X-ray diffraction studies confirm pure and silver (1%)-doped tin oxide having a tetrahedral crystal structure. The average crystalline size of the prepared nanoparticles is 11.82 nm, 14.95 nm. The bandgaps of pure and silver-doped tin oxide nanoparticles are 2.43 eV and 2.52 eV, respectively, due to the blue shift phenomenon. The FTIR analysis determines the functional group of pure and silver (1%)-doped tin oxide nanoparticles. The SEM images show that particles aggregate together to form a cluster, and the morphology of pure and silver (1%)-doped tin oxide in folding paper types of nanoparticles was present. The EDAX spectra confirmed the presence of Sn and silver nanoparticles. The TGA/DTA and DSC analyses of pure and silver (1%)-doped tin oxide nanoparticles were carried out, and it confirms the melting point decrease due to the (1%) dopant concentration.

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AP99

Optimized Electrochemical Performance of V_2O_5/g-C_3N_4 and V_2O_5/NiO Nanocomposite materials for Supercapacitor Applications

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Abstract:

V_2O_5/g-C_3N_4 and V_2O_5/NiO Nanocomposites including the nanosheets carbon and nanostructure have undergone extensive investigation to address concerns such as minimal intrinsic electrical conductivity, significant irreversibility, and excellent stability. A efficiency hydrothermal autoclave synthesis process was utilized to fuse V_2O_5/g-C_3N_4 and V_2O_5/NiOcomposite strands. The V_2O_5/g-C_3N_4 and V_2O_5/NiO nanocomposite is a hybrid nanoparticle with essential characteristics for supercapacitor electrodes that has been investigated. The phase structure, space group, and crystallite size of nanoparticles were determined by X-ray diffraction (XRD) peak analysis. The resultant materials are examined using Fourier Transform Infrared Spectrometer (FTIR), Field Emission Scanning Electron Microscopy (FESEM), and High Resolution Transmission Electron Microscope (HRTEM). Brunauer-Emmett–Teller (BET) and X-Ray Photoelectron Spectroscopy (XPS). The average crystalline diameters of graphitic carbon nitride g-C_3N_4, vanadium pentoxide V_2O_5, Nickel Oxide (NiO), V_2O_5 /g-C_3N_4 and V_2O_5/NiO composites are 28 nm, 16 nm, and 12 nm, respectively. FESEM maps the distribution of V_2O_5 in g-C_3N_4 nanosheets and nanostructure. XPS identifies the elements in the composite and confirms their presence, including V, O, C, and N. The V_2O_5 /g-C_3N_4 composite offers insights into the surface chemistry and potential interactions between V_2 O_5 and g-C_3 N_4 . V_2O_5 /g-C_3N_4 nanoparticles have a specific capacitance of 286.54 F/g, and are evaluated at 2 A/g utilizing the Galvanostatic Charge-discharge method, which gives improved stability even after 3000 charge/discharge cycles. Their exceptional performance is attributed to the synergistic effects of g-C_3N_4 and V_2O_5 /g-C_3N_4. Such impressive results may open up new avenues for these electrode materials in

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high-energy-density storage systems. The composites demonstrated exceptional cycle stability due to the distinctive composition of V_2O_5 and its synergy with g-C_3N_4.

Keywords:

Vanadium pentoxide (V_2O_5), supercapacitor, graphitic carbon nitride (g-C_3N_4), Nickel Oxide, nanosheets, nanostructure, and specific capacitance.

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AP100

Review on Energy applications of metal oxide composites derived from Metal Organic Framework (MOF) Materials

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Abstract

Nowadays, materials play an important role not only in human lives but also in chemical industries. Recently, metal-organic framework (MOF) materials have become a novel type of porous crystalline material that includes metal ions and organic ligands. A combination of MOF material and metal oxides has gained more recognition since it is profitable and ecofriendly. Due to the growing demand for energy, it is essential to conserve and utilize the existing energy efficiently. These materials are noteworthy consideration due to their highly porous structure, high surface area, and tunable properties. These characteristics make metal organic framework materials ideal precursors for synthesizing metal oxide composites. They have different applications in storage devices, photocatalytic and electrocatalytic processes. Mixed MOF have shown superior results in energy storage devices compared to single MOF. The electrode materials used in these devices play a crucial role in their performance. These materials are ideal because of their high reversible capacity, excellent rate and cycling properties.Additionally, the ability to modify the composition and shape of metal oxides via the selected precursor leads to increased electrochemical performance. Also, they have been considered as catalysts for energy conversion processes like hydrogen evolution and oxygen reduction. Furthermore, these cutting-edge materials have an enormous ability to solve energy storage issues and speed the switch to sustainable energy sources with ongoing research and development. This paper summarizes the use of MOF derived metal oxides and their composites in energy storage applications such as supercapacitors and batteries. It also discusses the future prospects and challenges for these materials.

Keywords: Metal-Organic Framework, porous, energy, photocatalytic, catalyst, hydrogen evolution.

AP101

EXAMINING THE IMPACT OF L-H DOPING ON THE STRUCTURAL, MECHANICAL, DIELECTRIC, AND THERMAL PROPERTIES OF LSMH SINGLE CRYSTALS

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Abstract

This study reports on the growth of high-quality pure and doped lithium sulfate monohydrate (LSMH) crystals via slow evaporation from an aqueous solution containing lithium sulfate monohydrate and trace amounts of L-Histidine. Comprehensive analyses reveal the LSMH crystal's potential as a nonlinear optical material. A comprehensive crystallographic analysis using X-ray diffraction determined the crystal system to be monoclinic, with the crystals adopting the non-centrosymmetric space group P2. Additional characterization via Fourier transform infrared (FTIR) spectroscopy unequivocally confirmed the presence of distinct functional groups within the molecular structure. Elemental composition analysis was performed using energy-dispersive X-ray spectroscopy (EDS), determining the precise percentages of constituent elements. Vicker's microhardness testing evaluated the crystal's hardness properties. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) revealed thermal stability up to approximately 140 °C.

Keywords: Crystal growth, X-ray diffraction analysis, Energy-dispersive X-ray analysis study, Vicker's Micro hardness studies, Thermal analysis, Fourier transform IR study

AP102

SYNTHESIS AND CHARACTERIZATION OF ZINC OXIDE NANOPARTICLES USING CORIANDERUM SATIVUM LEVES EXTRACT

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Abstract

The present study describes the synthesis of zinc oxide nanoparticles from the zinc acetate dehydrate through the green synthesis process using of coriander leaves extract. The synthesised sample was investigated using the following techniques: Uv-visible spectroscopy to conform the band gap energy of zinc oxide nanoparticles, Fourier Transform Infrared Spectroscopy(FTIR) to conform the functional group of the synthesised sample, X-ray diffraction(XRD) to conform the size and shape of the zinc oxide nanoparticles.

Key Words: Green synthesis, zinc oxide, UV- visible, XRD, FTIR, Nano particles.

AP103

BONE DEFECT REPAIRUSING SEA CUCUMBER AND SHRIMP SHELL – DERIVED HA- Ch

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Abstract

A skeletal imperfection, characterized by a sizable osseous void, necessitates innovative therapeutic interventions. Bone grafting, a prevalent surgical technique, facilitates orthopedic repair by augmenting osteogenesis. A composite matrix comprising collagen, hydroxyapatite (HA), and chitosan (Ch) demonstrates efficacy in promoting bone formation. This investigation assessed the efficacy of naturally sourced HA-Ch composites, derived from marine organisms (sea cucumbers and shrimp shells), in albino rats with femoral bone defects. Key parameters evaluated included cytokine levels, polymorphonuclear neutrophil (PMN) counts, serum liver enzymes, calcium, phosphate, and procollagen type 1 N-terminal propeptide (PINP) concentrations.

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AP104

Growth, Structural, Optical and Thermal Studies of Guanidinium Carbonate Single Crystal for NLO Applications

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Abstract

The exceptional properties of single crystals derived from organic and inorganic compounds are vital in nonlinear optical applications. Guanidinium, a potent base chemical with six potential donor sites for hydrogen bond interaction, readily reacts with inorganic and organic acids to yield outstanding crystalline products. A single crystal of Guanidinium carbonate was grown using solvent evaporation technique using water as a solvent at 35°C. Single crystal X-ray diffraction studies revealed that the crystal belongs to a tetragonal system with a space group of $P4_12_12$. Various functional groups and vibrational frequencies were identified using FT-IR spectral studies. UV-visible absorption analysis showed a lower cut-off wavelength of 223 nm with an energy bandgap of 5.6 eV. The material's thermal stability was assessed by TG-DTA and DSC analysis. It is concluded that the tittle crystal is thermally stable up to 207°C. The Second-order NLO efficiency was tested using the Kurtz-Perry powder technique and the efficiency was compared with standard KDP crystal.

Key Words: Single Crystal growth, FT-IR, UV-Vis analysis, Thermal analysis, SHG

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AP105

MOLECULAR STRUCTURE, HOMO-LUMO, MEP, THERMODYNAMIC PROPERTIES OF FLURAZEPAM MOLECULE- A MOLECULAR DOCKING STUDIES

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ABSTRACT

The structure of Flurazepam molecule was drawn using Chemdraw software. To obtain the exact geometry and electronic parameters of the Flurazepam molecule, a minimum energy structure optimization was carried out using B3LYP level of theories with the basis set 6-31G9(d.p)[1]. Docking analysis has been performed using Autodock software. Pymol[2] and Chimera [3] programs were used to view the protein-ligand complex and the intermolecular interactions between GABAA receptor and Flurazepam ligand molecule. The docked ligand molecule were lifted from the active site of GABAA receptor,and further asingle point energy calculation have been carried out by using the DFT methods(B3LYP/6-311G(d.p)). The gauss view software [4] was used to generate the MEP and HOMO-LUMO of localized and delocalized molecular orbitals are analysed.

Keywords: B3LYP, 6-31G9(d.p), GABAA, DFT method, MEP, HOMO-LUMO.

AP106

Synthesis of NiO Nanoparticles by Hydrothermal method for Supercapacitor application

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ABSTRACT

Nanoscience primarily deals with synthesis, characterization, exploration, and exploitation of nanostructured materials. These materials are characterized by at least one dimension in the nanometer range. NiO nanoparticles are extremely inexpensive, and highly stable conductive materials with a broad bandgap. These nanoparticles play a vital role towards the applications of super capacitor. Supercapacitor devices are emerging as one of the promising energy devices for the future energy technology.In this regard, NiO is considered one of the most promising positive anode materials. Nickel oxide nano powder has been successfully synthesized by hydrothermal method. Further, it was characterized by powder X-ray diffraction analysis for indexing purpose, shows that the title compound has a sharp and prominent peak which was supported by literature studies. The structural, surface morphology, spectral and optical studies were under process.

Keywords: X-ray diffraction, Hydrothermal method, Optical studies

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AP107

OPTICAL AND MORPHOLOGICAL ANALYSIS OF HYDROTHERMALLY SYNTHESIZED STRONTIUM TITANATE ($SrTiO_3$) NANOPARTICLES

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Abstract

Strontium titanate ($SrTiO_3$) nanoparticles are a form of perovskite oxide recognized for their distinctive structural, electronic, and optical characteristics. This study investigates the comprehensive optical and morphological analysis of strontium titanate ($SrTiO_3$) nanoparticles synthesized using the hydrothermal method. This approach was chosen for its ability to produce high-quality materials at lower temperatures, resulting in pure nanoparticles with uniform shapes and sizes. X-ray diffraction (XRD) analysis confirmed the formation of the perovskite structure of $SrTiO_3$ with an average crystalline size of 49 nm. Fourier Transform Infrared Spectroscopy (FTIR) studies confirmed the presence of metal oxygen(M-O) bond at 610cm^{-1}. The optical properties were assessed using UV-Visible spectroscopy, revealing a band gap of 3.2 eV. Field emission scanning electron microscopy (FESEM) images showed a coexistence of nanorod and spherical morphologies, indicating diverse growth mechanisms under hydrothermal conditions. Elemental composition and purity were verified by energy-dispersive X-ray spectroscopy (EDAX), which confirmed the presence of Sr, Ti, and O without impurities. The study highlights the influence of synthesis parameters on the structural and optical properties of $SrTiO_3$ nanoparticles, providing a deeper understanding of their potential for use in advanced functional materials.

Keywords: $SrTiO_3$, hydrothermal method, UV-Visible, FESEM, EDAX

AP108

VISIBLE LIGHT-DRIVEN PHOTOCATALYTIC ACTIVITY OF CORE-SHELL CeO2-ZnO-TiO2 TERNARY NANOCOMPOSITE

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Abstract

Photocatalysis under visible irradiation is an economically viable technique for treating environmental contaminants. A ternary nanocomposite CeO2-ZnO-TiO2 (CZT-NC) has been synthesized by a solution combustion technique and characterized by various techniques. XRD confirmed the crystallinity and supported the formation of CeO2, ZnO, and TiO2 phases in the nanocomposite. The average crystalline size and band gap of CZT-NC was calculated to be 22.76 nm and 1.96 eV respectively. FTIR analysis confirmed the existence of metal-oxygen bond at 501cm-1 . SEM micrograph displayed clustered spherical morphology, and the exact elemental compositions of the samples were confirmed from EDAX. HRTEM micrographs of CZT-NC displayed core-shell nanostructure, and the SAED pattern confirmed the growth direction. CZT-NC showed significant antibacterial activity with inhibition zone measurements approximately equal to 18 mm. The photocatalytic studies were conducted to degrade methylene blue (MB) dye under visible light irradiation. Systematically, the preliminary and kinetic studies were conducted. The maximum degradation efficiency of 98.53% was achieved at 120 mins under visible light irradiation and the reaction followed a pseudo-first-order kinetics. A decreased absorbance of the photo-catalytically degraded MB confirmed the enhanced activity of the prepared CZT-NC. This study paves the way for utilizing visible light active photocatalysts for wastewater treatment. Keywords: Ternary nanocomposite, CeO2-ZnO-TiO2, Photocatalysis, Methylene blue, Core-shell

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AP109

SOLUTION COMBUSTION SYNTHESIS OF CeO2/CuO/NiO TERNARY NANOCOMPOSITE FOR ENHANCED ANTIBACTERIAL AND PHOTOCATALYTIC ACTIVITIES

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Abstract:

In this study, a ternary nanocomposite CeO2/CuO/NiO (CCN) was successfully fabricated by solution combustion process using urea as a fuel. The structural, optical, and morphological details of the nanomaterial were analyzed using various characterization techniques. The powder X- ray diffraction (XRD) patterns confirmed the cubic and monoclinic phases with average crystallite size of 11.69 nm for CCN. The FTIR analysis confirmed the existence of metal – oxygen stretching and other bonds present in the synthesized sample. The energy band gap of CCN nanocomposite estimated from the UV-vis spectra narrowed to 1.86 eV, which enhanced the photocatalytic activity. Nanoflakes morphology was displayed from SEM images and presence of exact elements was confirmed from EDAX analysis. HRTEM images showed nanosheet morphologies and the SAED ring patterns exactly matched with the X-ray diffraction peaks. Antibacterial assays were performed against gram-positive and gramnegative bacteria, which showed good antibacterial activity. Photocatalytic degradation study revealed that the prepared nanocomposite as perfect catalyst with 91.34% efficiency for the degradation of Methylene Blue (MB) dye under visible irradiation. The study provides novel avenues for the preparation of highly-efficient and environmentally-stable photocatalysts in organic wastewater treatment. Keywords: CeO2/CuO/NiO nanocomposite; Solution Combustion; Antibacterial; Photocatalytic

AP110

MICROWAVE ASSISTED SYNTHESIS, CHARACTERIZATION AND IDENTIFICATION OF NON-LINEAR OPTICAL PROPERTY OF COPPER(II) COMPLEXES OF A NEW UNSYMMETRICAL MACROCYCLIC LIGAND

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Abstract

A hitherto new unreported pseudomacrocyclic Tetraaza tetradentate ligand **$(DOH)_2bzo(CH_3)$** (L) has been synthesized by conventional and microwave assisted synthesis methods under two step strategy. diacetyl monoxime was treated with 3.4-diamino-toluene to yield the Tetraaza tetradentate ligand (L).The prepared ligand was complexed with Cu(II) metal ions to yield [Cu(DO(DOH)bzo(CH_3)Cl], [Cu(DO(DOH)bzo(CH_3)Br], Cu(DO(DOH)bzo(CH_3)I] and [Cu(DO(DOH)bzo(CH_3)NO_3]. The ligand and the metal complexes are characterized by IR spectra, NMR, UV-visible, conductivity measurements, magnetic susceptibility studies and cyclic voltammetry. The Tetraaza tetradentate ligand (**L**) employed in the present investigation seems to be enhanced substitute, for vitamin B_{12} model compound. It coordinates very readily with copper metal providing a planar tetradentate donor array, The axial site is available for coordination wherein we are able to alter the coordinating anions. It can serve as a common vehicle to study the complexation properties of the various transition series and the lanthanides and actinides also. The stability of the various metal ion complexes of these ligands would provide ample information regarding the coordinating capability and the stability of its complexes. The variation of the axial site with different coordinating anions with the same ligand frame work, would throw light on the variation in spectro chemical and physiochemical properties with regard to the axial ligand, and thus provides a platform to set up a spectro chemical series of ligands.

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AP111

Review on recent advances of Tio_3 Nanoparticles: Synthesis Characterization and Diverse Applications

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Abstract

This review aims to summarize recent studies on TiO_3 nanoparticles, focusing on their synthesis methods, structural characterization, and functional properties. synthesizing Titanium nanoparticles because of their substantial applications across diverse technological and industrial fields. Nanoparticles are a class of lenient magnetic nanomaterials, which have potentially high magnetic, optical, electrical, and dielectric properties. These properties include a high value of permeability, low power losses, permittivity, saturation magnetization, resistivity, and other beneficial properties that make them promise candidates for applications in various fields. These Compounds are also used in biomedical areas such as MRI and cancer treatments. In additional thermal behavior and phase transformation of the gels was investigate by the differential scanning calorimetry – thermogravimetry. Further research is needed to optimize their synthesis, stability, and scalability for practical utilization.

Key words: Nanoparticles, Tio_3, Permittivity, Resistivity, phase transformation

AP112

SYNTHESIS OF $MnFe_2O_4$ AND COBALT DOPED $MnFe_2O_4$ NANOCOMPOSITES FOR DYE DEGRADATION APPLICATIONS

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ABSTRACT

Nanoparticles being the smallest unit of Nanotechnology are playing important role in various field such as environmental applications Specially water purification. The present work highlight the synthesis of MnFe2O4 and co-doped MnFe2O4 Nanocomposites by the Co-Precipitation method. The spinel ferrite nanoparticles with sensitive magnetic response properties and high specific surface area were prepared from metal chlorides. The current method of study is cheap, simple, and also easily controls the particle size. The $MnFe_2O_4$ nanoparticles formation is confirmed by the change of color from pale green to dark brown which is mainly due to the great phenomenon of surface plasma resonance. The characterization of $MnFe_2O_4$ is carried out by XRD, FTIR, UV – DRS, SEM with EDAX, and for the application of the dye degradations. From the XRD analysis the mean grain size and structure of the material is calculated. The FTIR study reveals and it is much clear that the OH stretching, C=O stretching, C=C stretching, and N−H bending functional groups are present which are expected from the synthesized sample. The band gap energy and absorption range was calculated by UV – DRS. In the applications, methylene blue dye was used driven by the visible light.

Keywords: Co-Precipitation, ferrite nanoparticles, XRD, FTIR, Degradation, Catalytic activity

AP113

SYNTHESIS AND CHARACTERIZATION OF PURE AND COBALT-DOPED TiO_2 NANOPARTICLES BY CO-PRECIPITATION METHOD

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ABSTRACT

In the present study reveals that the preparation of pure and Cobalt doped TiO_2 nanoparticles were obtained from co-precipitation method. The structural, morophological, optical and vibrational analysis of prepared nanoparticles were characterized through XRD,SEM, UV and FTIR. The XRD confirms the anatase and tetragonal phase structure of pure TiO_2 and Orthogonal structure of cobalt-doped TiO_2 nanoparticles respectively. The corresponding hkl values of pure and co-doped nanoparticles were found (1,0,1),(1,1,2),(2,0,0) and (2,2,0),(1,2,1),(3,0,1),(2,4,0),(2,0,2) .The Diameter of pure and cobalt-doped TiO_2 nanoparticles is found to be 15nm and 17nm.The SEM verify the spherical shape for pure and irregular shape for cobalt-doped TiO_2 Nanoparticles. The UV peak for pure is 318nm it occurs blue shift and cobalt-doped TiO_2 is 249nm it occurs redshift respectively. The FTIR shows the O-H stretching frequency,-OH groups of water and the appearance of Ti-O-Ti is a frequency absorption peak between 440cm^{-1} to 622cm^{-1}.The Co-doped TiO_2 frequency peak exhibits at 444cm-1,while the doped sample shows the shifting frequency about 423cm^{-1} to 425cm^{-1}.

KEYWORDS: XRD, SEM WITH EDAX,UV-VIS,FTIR,CO-PRECIPITATION METHOD.

AP114

NANOTECHNOLOGY

S.SAMPREETHI & K.LOGADHARSHINI

Abstract

This abstract explores the ultimate applications of nanotechnology across various fields, including medicine, electronics, and environmental science. In medicine, nanoparticles enhance drug delivery and imaging techniques, leading to more targeted therapies. In electronics, nanoscale materials improve the performance of devices, enabling faster and smaller components. Additionally, nanotechnology plays a crucial role in environmental remediation, facilitating the removal of pollutants. By delving into these applications, this overview highlights the transformative potential of nanotechnology in advancing innovation and addressing global challenges.

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AP115

Biomaterials and healthcare nanotechnology

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Abstract

Biomaterials and healthcare nanotechnology represent transformative frontiers in modern medicine, offering innovative solutions for diagnosis, treatment, and regeneration. Biomaterials, engineered from natural or synthetic substances, are designed to interact with biological systems for therapeutic or diagnostic purposes. These materials have evolved to support a wide range of applications, from wound healing to tissue engineering and drug delivery.Nanotechnology further enhances the potential of biomaterials by enabling precise manipulation at the nanoscale, allowing for targeted drug delivery, improved diagnostic imaging, and the development of smart implants. Nanoparticles, nanofibers, and nanostructures can be designed to respond to biological signals, release drugs in a controlled manner, or promote cell growth in damaged tissues.This integration of biomaterials and nanotechnology promises to revolutionize healthcare by offering personalized medicine, reducing side effects of treatments, and improving patient outcomes. However, challenges such as biocompatibility, long-term safety, and ethical considerations remain critical areas of research. As these technologies continue to evolve, they hold the potential to reshape the landscape of healthcare, enabling more effective and minimally invasive therapeutic strategies.

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AP116

Structural, optical and electrochemical Properties of $NiWO_4/WO_3$ nanocomposites

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Abstract

This study investigates the synthesis, characterization, and electrochemical properties of $NiWO_4/WO_3$ nanocomposites. X-ray diffraction (XRD) and transmission electron microscopy (TEM) reveal the formation of crystalline $NiWO_4$ nanoparticles dispersed on WO_3 nanorods, confirming the composite's structural integrity. UV-Vis spectroscopy exhibits enhanced optical absorption and reduced bandgap energy, indicating improved visible-light responsiveness. Electrochemical measurements demonstrate enhanced pseudocapacitive behaviour, increased specific capacitance, and excellent cycling stability. The synergistic combination of $NiWO_4$ and WO_3 enhances electron transfer, surface area, and redox activity, making these nanocomposites promising candidates for energy storage and optoelectronic applications.

Keywords: Nanocomposites, SEM, Nanorods, Energy storage, Optoelectronics.

AP117

Cost Effective detection of Arsenic (V) using the Chromogenic ligand coated paper strips

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ABSTRACT

We report an Ultrafast and on-spot detection of Arsenic (As-V) heavy metals, Arsenic. The chromogenic ligand-1 (L-1) will be synthesized by a simple condensation reaction of 2-aminobenzothiazole with 10-hydroxyanthracene-9-carbaldehyde in mild acidic DMF medium using microwave. We characterized the ligand with L-1 using the UV-vis, PL, FT-IR, ^{1}H-NMR, ^{13}C-NMR, and HR-MS studies. L-1 showed As-V adsorption capacity of 100 ppm. The adsorption capacity was varied between 10 to 100 ppm. Further the ligand was used in the paper strip-based detection purpose of As-V. The ligand showed maximum detection limit of 50 ppb for the As-V. The chromogen coated paper strips was Characterized using various spectroscopic techniques like FTIR, PXRD, XPS, UV-Vis, TG and DSC, SEM, and TEM. The utilization of paper strips-based detectors for As-V will reduce a large amount of energy consumption, enormous sample preparation effort and time.

Keywords: Arsenic removal; metal-organic frameworks; adsorption; granular adsorbents; water remediation.

AP118

Optical and Ferroelectric properties of $PbWO_4$ nanomaterial prepared by coprecipitation method

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Abstract

Lead tungstate ($PbWO_4$) nanomaterial was successfully synthesized using the coprecipitation method. The structural properties were investigated using X-ray diffraction (XRD), revealing a tetragonal scheelite phase with crystallite size of approximately 30 nm. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) images showed uniform nanoparticles with spherical morphology. The optical properties were studied using UV-Vis spectroscopy, exhibiting a direct bandgap of 3.8 eV. Ferroelectric characterization showed a remnant polarization (Pr) of 0.35 μC/cm² and coercive field (Ec) of 14 kV/cm, demonstrating promising ferroelectric properties. This study demonstrates the potential of $PbWO_4$ nanomaterial for optoelectronic, energy storage, and ferroelectric applications.

Keywords: Lead tungstate; SEM; Bandgap; Ferroelectric.

AP119

Waste battery electrode derived N-doped RGO incorporated boron nitrate sheets composite for Asymmetric Supercapacitor Device

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Abstract

This study explores a composite supercapacitor device made from waste battery electrode-derived nitrogen-doped reduced graphene oxide (N-doped RGO) combined with boron nitride sheets. The goal is to enhance energy storage capabilities for applications in net zero energy buildings. The incorporation of N-doped RGO improves electrical conductivity and capacitance, while boron nitride contributes to structural stability. This innovative approach not only utilizes waste materials but also supports sustainable energy solutions, making it a promising option for efficient energy storage in eco-friendly architectures. This work is focused on the design of N-doped reduced graphene oxide/hexagonal boron nitride (N-rGO/h-BN), as electrode materials for supercapacitor applications. Interestingly, asymmetric supercapacitor devices were made up of N-rGO/h-BN and rGO as positive and negative electrodes, respectively, and nickel foam were used as a substrate. The nickel foam as substrate exhibits a high capacitance retention of 94 % after 1000 cycles in a coin-cell configuration. As a result, N-rGO/h-BN based composites with superlattice for next-generation supercapacitor applications.

Keywords: Nanocomposites, Supercapacitor, Specific energy, specific power and cyclic stability.

AP120

Synthesis and Characterization of Mn-doped $ZnFe_2O_4$ Nanoparticles for Enhanced Magnetic and Catalytic Properties

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ABSTRACT

Manganese-doped zinc ferrite (Mn-doped $ZnFe_2O_4$) nanoparticles were synthesized using a sol-gel method. The influence of manganese doping on the structural, magnetic, and catalytic properties of the nanoparticles was investigated. X-ray diffraction (XRD) analysis confirmed the formation of a single-phase spinel structure. Fourier-transform infrared spectroscopy (FTIR) revealed the presence of metal-oxygen bonds. The morphology and microstructure of the nanoparticles were examined using high-resolution transmission electron microscopy (HRTEM) and field emission scanning electron microscopy (FESEM). X-ray photoelectron spectroscopy (XPS) was employed to study the chemical composition and oxidation states of the elements. Brunauer-Emmett-Teller (BET) analysis determined the specific surface area.VSM measurements showed that the saturation magnetization (Ms) increased with increasing manganese content up to a certain limit, beyond which it decreased. The coercivity (Hc) exhibited a similar trend. The magnetic properties were attributed to the cation distribution and crystallite size. The catalytic activity of the Mn-doped $ZnFe_2O_4$ nanoparticles was evaluated for the degradation of methylene blue (MB) dye under UV irradiation. The results indicated that the manganese-doped samples exhibited enhanced catalytic performance compared to the undoped $ZnFe_2O_4$.

 ISBN: 978-819-770-0460

Keywords: Mn-doped $ZnFe_2O_4$, nanoparticles, sol-gel synthesis, magnetic properties, catalytic activity, XRD, FTIR, VSM, HRTEM, FESEM, XPS, BET.

AP121

Nanorod-shaped Co-Ni dual-doped ZnO nanoparticles for enhanced photocatalytic and antibacterial activities

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Abstract

This study synthesized cobalt-doped ZnO (CZ) and cobalt-nickel dual-doped ZnO (CNZ) NPs by hydrothermal method. Various analytical techniques, such as XRD, UV-vis, FTIR, PL, SEM, EDAX, and HR-TEM, were employed to investigate the effect of doping transition metal ions in the ZnO lattice. The powder X-ray diffraction (XRD) patterns confirmed a hexagonal structure with average crystallite sizes of 31.2 nm and 26.8 nm for CZ and CNZ nanoparticles, respectively. Tauc's plot showed that the energy bandgap was redshifted to 2.93 from 2.86 eV by doping transition metal ions in ZnO. The photoluminescence spectrum displayed various peaks, indicating the emission behaviour of the nanomaterials. The photocatalytic performance of the catalysts was tested under visible light sources against Crystal Violet (CV) dye. The degradation efficiency, for CNZ achieved a maximum degradation efficiency of 96.3 %. Antibacterial activity was evaluated against gram-positive (B. subtilis and S. aureus) and gram-negative (E. coli and P. aeruginosa) bacteria strains. The CNZ exhibited higher photocatalytic and antibacterial activity than CZ.

Keywords: dual-doped ZnO NPs, hydrothermal method, crystal violet dye, dye degradation, antibacterial activity

AP122

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING ADHATODA VASICA LEAF EXTRACT

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ABSTRACT

This study reports the biogenic synthesis of silver nanoparticles (AgNPs) using Adhatoda vasica leaf extract at room temperature. The prepared AgNPs were characterized using UV-visible spectroscopy, Fourier-Transform Infrared Spectroscopy, Powder X-ray diffraction, Scanning Electron Microscopy, and Thermogravimetric Analysis. The bio-reduction method employed is free from toxic chemicals, organic solvents, and external reducing, capping, and stabilizing agents. The synthesized AgNPs exhibited a spherical shape with particle sizes ranging from 3.88 to 23.97 nm and a face-centered cubic structure. UV-visible spectral analysis confirmed the formation of AgNPs with a characteristic surface plasmon resonance band at 419 nm. The optical bandgap (Eg) value of 2.26 eV for AgNPs was found to be effective for rapid photocatalytic degradation of all three dyes, following pseudo-first-order kinetics.

Keywords: Ag NPs, Synthesis, Antibacterial Activity, Optical Properties.

AP123

Synthesis and structure of Zinc oxide doped Polyindole Nanocomposites

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ABSTRUCT

We present the synthesis and characterization of nano Zinc Oxide (ZnO), nano Polyindole (PIN), and nano PIN/ZnO composite in this work. Polyindole was produced by oxidative chemical polymerization using ferric chloride. ZnO nanoparticle, PIN/ZnO nanocomposite, and PIN structure were all examined using scanning electron microscopy (SEM). The EDAX technology was used to demonstrate the chemical characterisation and elemental analysis. Measurements of the crystallite sizes and degree of crystallinity were made using the X-Ray Diffraction (XRD) method. It is clear that the dopant improves conductivity since the UV-vis spectrum shows that the band gap of the doped PIN decreases.

Key Words: Polyindole (PIN), Zinc Oxide (ZnO), SEM, UV, XRD.

The moment fixed by the good master is not near
but you shall see the fruit in the future

- Servant of God Michael Ansaldo

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