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1ST INTERNATIONAL CONFERENCE ON EMERGING TRENDS IN SCIENCE AND TECHNOLOGY (ICETST-2022)

December 01st-03rd, 2022

Convenor

Dr. Himamaheswara rao

Co- Convenor

Dr. M. Mallikarjuna Rao
Dr. B. Haribabu

Organized by Department of

Humanities & Sciences

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1st INTERNATIONAL CONFERENCE ON EMERGING TRENDS IN SCIENCE AND TECHNOLOGY

Editor

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CHAIRMAN MESSAGE

We feel enthralled on this gracious occasion to welcome you to the 1st International Conference on "Emerging Trends in Science and Technology (ICETST-2022)" organized by Departments of H&S during 01st -03rd December, 2022 at PACE Institute of Technology and Sciences, Ongole, Andhra Pradesh, India. This conference serves as a dynamic platform for the exchange of ideas, research findings, and innovative practices in the field of science and technology. With the rapid advancements in various disciplines, it is essential for us to stay at the forefront of emerging trends, and ICETST-2022 provides a unique opportunity to do just that.

Furthermore, I encourage all participants to take advantage of the diverse array of opportunities provided by ICETST-2022. Engage in lively discussions during the interactive sessions, attend the insightful keynote speeches, and connect with fellow participants to expand your professional network. This conference is not only about academic exchange but also about fostering a sense of camaraderie and community among like-minded individuals.

We would like to acknowledge the efforts of our members and references and their priceless help in the review process. I thank the ICETST-2022 steering committee, for their vision and leadership. We are awaiting the exciting presentations, discussions, and sharing of technical ideas with colleagues from around the world.

We thank you for attending the conference and we hope that you enjoy your visit.

Warm regards
Dr. M. Venugopal
CHAIRMAN
PACE Institute of Technology and Sciences

SECRETARY MESSAGE

It is my great pleasure to welcome you to the International Conference ICETST-2022. The conference, scheduled to take place during 01st -03rd December, 2022, aims to foster collaboration and interdisciplinary interactions among researchers, scholars, academicians, industry professionals, and students from around the globe. It is a convergence point for intellectual stimulation, knowledge sharing, and networking, enabling participants to explore new dimensions of scientific research and technological innovations.

I would like to express my deepest appreciation to the organizing committee, faculty members, staff, and student volunteers for their unwavering dedication and efforts in making this conference a reality. Their meticulous planning, attention to detail, and commitment to excellence have been instrumental in shaping ICETST-2022 into an extraordinary event.

I would also like to extend my sincere gratitude to all the participants who have chosen to be a part of this conference. Your presence and active engagement will undoubtedly contribute to the success of this event. ICETST-2022 offers you an exceptional platform to showcase your research, learn from eminent experts, and forge meaningful collaborations that may lead to groundbreaking advancements in science and technology.

Thank you, and I wish you all a fruitful and memorable experience at the International Conference on Emerging Trends in Science and Technology (CETST-2022).

Warm regards,

Dr. M. Sridhar, B.E, M.Tech, MBA
SECRETARY
PACE Institute of Technology and Science

PRINCIPAL MESSAGE

Dear Participants, Researchers, and Distinguished Guests,

It is with great pleasure and enthusiasm that I extend my warmest greetings to all of you on behalf of PACE Institute of Technology and Sciences, Ongole. As the Principal of this esteemed institution, I am delighted to announce the 1st International Conference on Emerging Trends in Science and Technology (ICETST-2022), organized by the Department of H&S.

This conference signifies a significant milestone in our pursuit of academic excellence and our commitment to fostering innovation and research. It is a platform that brings together the brightest minds from across the globe to discuss and explore the emerging trends in science and technology that are shaping our world. The field of science and technology is rapidly evolving, transforming the way we live, work, and interact with our environment. It is essential for us, as educators, researchers, and professionals, to stay abreast of these advancements and contribute to the ever-growing body of knowledge. The 1st International Conference on Emerging Trends in Science and Technology provides us with an exceptional opportunity to do just that.

I would also like to express my heartfelt appreciation to all the participants who have chosen to be a part of this conference. Your presence, contributions, and active engagement will undoubtedly make this event a resounding success. In conclusion, I extend my best wishes to all the participants, speakers, and organizers of the 1st International Conference on Emerging Trends in Science and Technology.

Thank you, and I wish you all a fruitful and rewarding conference experience.

Warm regards,

Dr. G. V. K. Murthy B.E, M.Tech, Ph.D
PRINCIPAL
PACE Institute of Technology and Sciences

HOD MESSAGE

I deem it my immense pleasure to invite you to the conference ICETST-2022, which is going to be held during 01st -03rd December 2022 at PACE Institute of technology and Sciences, Ongole. Our conference aims to facilitate knowledge exchange, interdisciplinary collaboration, and networking among participants from diverse scientific and technological backgrounds. It is designed to encourage the sharing of innovative ideas, research findings, and best practices. Through keynote speeches, panel discussions, and interactive sessions, we hope to ignite intellectual curiosity, inspire new research directions, and foster fruitful collaborations.

On behalf of the entire institution, I extend my sincere gratitude to the organizing committee, faculty members, and staff who have worked tirelessly to bring this conference to fruition. Their dedication, expertise, and unwavering support have been instrumental in shaping this event into a remarkable opportunity for intellectual discourse and knowledge dissemination.

In conclusion, I extend my best wishes to all the participants, speakers, organizers, and supporters of ICETST-2022. This conference would certainly provide inspiration, innovation, and knowledge creation. Let us embrace the emerging trends in science and technology, and together, let us shape a better future for generations to come.

Warm regards,

Mr. M. Raveendra
HOD, Department of H&S
PACE ITS, Ongole

CONVENER MESSAGE

Dear Esteemed Participants, Distinguished Guests, and Colleagues,

It is my utmost pleasure and honour to welcome you all to the 1st International Conference on Emerging Trends in Science and Technology, organized by the Department of H&S at PACE Institute of Technology and Sciences, Ongole. This conference represents a significant milestone in our academic journey, as we bring together brilliant minds from around the world to delve into the ever-evolving landscape of science and technology.

The conference program has been thoughtfully designed to cover a diverse range of topics, ensuring that every participant can find sessions that resonate with their interests and areas of expertise. From cutting-edge developments in Mathematics, Physics, Chemistry and Nanotechnology, and beyond, ICETST-2022 promises to deliver engaging discussions and thought-provoking presentations.

I extend my deepest gratitude to the organizing committee, reviewers, and volunteers who have dedicated their time and effort to ensure the success of this conference. Their commitment, professionalism, and attention to detail have been instrumental in shaping this event into a remarkable gathering of minds.

I would also like to express my sincere appreciation to all the participants who have chosen to be a part of this conference. Your presence, contributions, and active engagement are crucial to the success of this event. Your research, ideas, and perspectives will pave the way for groundbreaking advancements and solutions to the challenges we face in science and technology.

Thank you, and I wish you all a memorable and rewarding experience at the 1st International Conference on Emerging Trends in Science and Technology.

Warm regards,

Dr. V. Himamaheswara Rao
Convener, ICETST-2022
PACE ITS- Ongole.

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1st INTERNATIONAL CONFERENCE ON EMERGING TRENDS IN SCIENCE AND TECHNOLOGY (ICETST-2022)

THEMES OF CONFERENCE

The conference covers a wide range of topics but is not limited to the following

TRACK 1:

Synthesis and properties of materials
Nanomaterials
Composites, Polymer materials
Glasses and ceramics
Biomaterials
Electronic, optical and magnetic materials
Optics and Photonics
Quantum Technology

TRACK 2:

Green chemistry
Bio mass,
waste management,
solid chemistry,
organometallic chemistry
catalysis

TRACK 3:

Algebra
Discrete Mathematics
Fluid Dynamics
Probability & Statistics
Mathematical Modelling
Operation Research
Graph Theory
Fuzzy sets & logic
Computational Mathematics
Complex Analysis
Data analysis

About PACE Institute of Technology and Sciences (Autonomous)

PACE INSTITUTE OF TECHNOLOGY AND SCIENCES (PACE ITS), was established Under the Srinivasa Education Society in 2008 at Valluru village near Ongole. It has been running successfully since the academic year 2008-2009. PACE, being an NRI project is committed to creating a world- class technical education.

The Institution was established in the year 2008 with a humble beginning with a modest strength of 240 students, by the founders Dr.M.Venugopal Rao, Chairman, and Dr.M.Sridhar, Secretary & Correspondent. Ever since it has been flourishing from the minimum strength to the immense student strength in the stewardship of enlightened management. PACE has been situated in a panoramic area of 11.0 acres. The institute has obtained a place of pride and become a pioneer in imparting higher education in the rural domain. The management has initiated courses such as B.Tech, M.Tech, MBA, and Diploma.

The AICTE, New Delhi approved PACE Institute of Technology and Sciences in the year 2008 and sanctioned the strength of 60 students for each branch of EEE, ECE, CSE, and IT. In the year 2009-2010, CIVIL and MBA were approved successively. In the consecutive year 2010, the college sanctioned the Mechanical and Automobile branches. An M.Tech Program (CSE) and 120 seats for B.Tech (CSE) were sanctioned by AICTE. In the year 2012, the institute was approved by AICTE for M.Tech Programmes in ECE and EEE, along with 120 seats for B.Tech (Civil & Mechanical). By adding another feather to the eminence of PACE, the State Board of Technical Education of Andhra Pradesh sanctioned Diploma (EEE & MECHANICAL) in the year 2012. The various courses run by the Management are endowed with a team of dedicated faculty working with a missionary zeal.

About the Department of Humanities and Sciences

The Department of Humanities and Sciences of PACE ITS was established in the year 2008-2009. It offers versatile subjects of basic sciences which are very much required for all fields of engineering. The department possesses expertise faculty to tune the students mind towards the innovative thinking. The department acquires the state-of-the-art labs and equipment to facilitate the students to acquire implication and industry required skills. It is committed to equip the students with domain expertise, research and soft skills. The department offers innovative teaching with hands-on training to the students to meet the requirements of industry and society through well-equipped laboratories under the guidance of highly qualified, experienced, and dedicated faculty. The Department continuously conducts several seminars, webinars, Guest talks and Workshops to enrich student abilities and Knowledge. The department students are encouraged to participate in co-curricular and extra-curricular activities inside and outside the Institution.

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Key Note Address

Nano-Magnetic Materials for Spintronics Applications

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ABSTRACT

At present the modern world developed new novel technology in various fields. Among them, Magnetism is one of the predominant fields applied to many technological applications. Here, Spin is the dominant origin of Magnetism, thus, when spins of electron in a solid are aligned some extent in the same direction, the solid become Magnet. An electron has two attributes "Charge" and "spin" (i.e basically called Spintronics). In general, 14 types of magnetism, within these only 5 types of (like: Dia, Para, Ferro, Anti-Ferro, and ferri) magnetism materials only using for specific some other applications. Each and every magnetism having or exhibiting a different property. If the sign of the coupling is positive, the magnetic moments are aligned parallel to each other (i.e. ferromagnetism) and if negative, anti-parallel to each other (i.e. anti-ferromagnetism). The critical Temperature (T_c) at which this magnetic order is lost is higher, if the coupling is stronger. The T_c of a ferromagnetic material is called the Curie temperature. In particularly, Ferro magnetic (Fe, Ni, Co) materials effectively using for Spintronics applications like Giant magnetoresistance (GMR), anisotropic magnetoresistance (AMR), storage devices (i) Magnetic Random access memory (MRAM), (ii) Dynamic random–access memory (DRAM), (iii) Static random-access memory (SRAM), (iv) Flash, (vi) Ovonyx unified memory (OUM), (vii) Ferroelectric random access memory (FeRAM) and other applications in Hyperthermia for cancer treatment, computed tomography (CT) scan. Ferri magnetic materials mostly using in communications in specific ferrite materials using high frequency applications like Amplitude modulation (AM) and de-modulation (DM), particularly Microwave ferrites: 100 MHz-500MHz, ferrite antenna 10 MHz – 100MHz, Ceramic hard ferrite magnetic materials can possible to use loudspeakers, motor generator and etc.,. Recently, instead of two ferromagnetic layer, using Heusler alloys for both top and bottom electrode and in between the sandwich layer is MgO is predicted to have high spin polarization. And also, MgO barrier can be replaced by topological insulator for tunneling layer. To conclude, the ferromagnet/insulator interface plays a critical role in the enhancement of the TMR ratio.

Invited Talk-1

Design, Synthesis and Applications of MOFs based Artificial Lotus Leaves for Gas Separation and Oil Spills Cleanup Applications

Prof. Koya Prabhakara Rao*,

New Generation Materials Lab (NGML), Department of Chemistry, Vignan's Foundation for Science Technology and Research (VFSTR) (Deemed to be University), Vadlamudi, Guntur-522 213, Andhra Pradesh, India

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Abstract: Porous coordination polymers (**PCPs**), which also known as metal-organic frameworks (**MOFs**) are emerged as potential materials of the decade, particularly forgas storage, separation, catalysts and sensors etc. However, PCPs existing in the literature were mostly instability with respect to moisture and bulk water. Besides these traditional **PCPs**, we have been designed and synthesized an organic rich low density, $BTMBH_3$ = 1,3,5-benzenetris(*m*-benzoic acid)) ligand. Using this novel ligand we achieved first time a series[1-3] of six new superhydrophobic porous coordination polymers (**SPCPs**), with molecular formulas, **$Zn_4(\mu_3\text{-}OH)_2(BTMB)_2\supset$Guest (1),$Zn_2M_2(\mu_3\text{-}OH)_2(BTMB)_2\supset$Guest** [**M** = **Co** (**2**) and **Ni** (**3**)],**Pb(H-BTMB)⊃Guest (4)** and**$M_4(OH)_2[(BTMB)_2(4,4'\text{-}Bipy)_3]\supset$Guest** [**M** = **Zn** (**5**) and **Cd** (**6**)]. These interesting **SPCPs**, possesses an aromatic terminating low density surface that is highly corrugated over the nano-scale causes the superhydrophobic (self-cleaning) nature with contact angles > 150 (degree). Moreover, this superhydrophobic nature is stable even at high temperature, whose stability depends on structure, metal coordination and guest species *etc*. All these **SPCPs** exhibit very interesting gas separation and, oil and organic solvent spills cleanup applications. In this presentation, we discuss, synthesis, structures, characterizations, properties and applications these novel **SPCPs**. This study can provide a roadmap for design and synthesis of novel superhydrophobic porous materials for the applications in the energy and securing the environment.

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Invited Talk-2

Luminescence and Structural investigations of pure, Pr^{3+}, Nd^{3+}, Dy^{3+}, Yb^{3+} doped Cadmium Calcium Pyrophosphate Nanophosphors for LED applications

Sk. Munimasthani[1,2], S. Sarathkumar[1,2]and **R.V.S.S.N.Ravikumar[2]**

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Abstract: Nanophosphors are solid inorganic materials obtained a massive interest throughout the past few years because of their unique luminescence characteristics other than their bulk phosphor materials. In this work, pure and rare earth ions doped (Pr^{3+}, Nd^{3+}, Dy^{3+} and Yb^{3+}) Cadmium Calcium Pyrophosphate (CdCaP) nanophosphors were synthesized by solution combustion method and studied their structural, optical and photoluminescent properties. The prepared nanophosphors are characterized by means of X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Field Emission Scanning Electron Microscopy (FE-SEM) with EDAX, Diffuse Reflectance Spectroscopy (DRS) and Photoluminescence Spectroscopy (PL). The powder X-ray diffraction results of trivalent rare earth ions doped phosphors sample confirm the prepared phosphor samples are exhibited triclinic system. The observed diffraction patterns are in good agreement with the standard diffraction data of **JCPDS file No: 81-2463**. FT-IR spectra of all the pure and trivalent rare earth ions doped CdCaP samples are exhibited the fundamental vibrations of PO_3, P-O-P, P=O, P-O-H and water molecules. Slight shifting of band positions is observed due to change in ionic radii of trivalent rare earth ion dopants.

The DRS data of trivalent rare earth ions in the CdCaP nanophosphors, band gap estimations provide scope for prepared phosphors in lightening applications and optoelectronic devices. Emission spectrum of pure, rare-earth ions doped CdCaP nanophosphors exhibited various bands between UV to VIS regions. The emission regions for pure, rare-earth ions (Pr^{3+}, Nd^{3} , Dy^{3+}, and Yb^{3+}) doped CdCaP nanophosphors are observed in blue, orange, yellow, blue and greenish yellow regions respectively. The CRI values and color purity of the prepared samples suggests that they possess better color purity with good CRI value which are needed for commercial applications.

Invited Talk-3

PHOTOLUMINESCENCE BIOSENSORS FOR FAST DETECTION AND QUANTIFICATION OF BIOMOLECULES

Dr. K . Sowri Babu

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Abstract: In this work, Photoluminescence is used as a powerful tool to detect bio-molecule. ZnO nanorods were synthesized and their PL is utilized to detect cancer cells in human body. Cancer is the second cause of death worldwide. This devastating disease requires specific, fast, and affordable solutions to mitigate and reverse this trend. A step towards cancer-fighting lies in the isolation of natural killer (NK) cells, a set of innate immune cells that can either be used as biomarkers of tumor genesis or, after antilogous transplantation, to fight aggressive metastatic cells. In order to specifically isolate NK cells (which express the surface NKp30 receptor) from peripheral blood mononuclear cells, a ZnO immune affinity-based platform was developed by electro-deposition of the metal oxide on a flexible indium tin oxide (ITO)-coated polyethylene terephthalate (PET) substrate. The resulting crystalline and well-aligned ZnO nanorods (NRs) proved their efficiency in immobilizing monoclonal anti-human NKp30 antibodies (mAb), obviating the need for additional procedures for mAb immobilization. The presence of NK cells on the peripheral blood mononuclear cell (PBMCs) fraction was evaluated by the response to their natural ligand (B7-H6) using an acridine orange (AO)-based assay. The successful selection of NK cells from PBMCs by our nanoplatform was assessed by the photoluminescent properties of AO. This easy and straightforward ZnO-mAb nanoplatform paves the way for the design of biosensors for clinic diagnosis, and, due to its inherent biocompatibility, for the initial selection of NK cells for auto transplantation immunotherapies.

Invited Talk-4

EFFECTIVE ENGINEERING STRATEGIES FOR PEROVSKITE SOLAR CELLS; RECENT ADVANCES AND PERSPECTIVES

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Abstract: Perovskites have been one of the most promising futures of solar cell technology due to their revolutionary impact on device performance. Recently, perovskite solar cell has shown great achievement in power conversion efficiency of 26.2% in 2022 certified by the NREL. However, such a breakthrough technology has limitations for the market-up due to inherent instability affected by heat, light, and moisture, which are serious issues for them to overcome the barrier to commercialization. The main aim of this presentation is to gain insight into the different engineering strategies of perovskite solar cells. Importantly, these strategies are summarized from several engineering aspects such as; interfacial engineering, device structure engineering, deposition method-based engineering, compositional engineering, bandgap engineering, and dimensional engineering. Interestingly, these strategies govern the charge transport process, recombination, charge transfer resistance, carrier injection/collection of the electrodes, etc. Finally, we discuss future perspectives of the combined understanding of various engineering aspects for further enhancing the device's performance.

Keywords:*Renewable Energy, Photovoltaic Technology, Perovskite Solar Cell, Efficiency***,** *Stability, Lifetime.*

Invited Talk-5

FENTON TREATMENT ON RAW TEXTILE EFFLUENT: EFFECT ON ECOTOXIC

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Abstract: The initial parameters COD (631mg0_2/L), TDS (8300mg/L), Salinity (4.4mg/L), Conductivity (8.74 S/cm), Acidity, Alkalinity and pH of textile industry are studied. The application of Fenton treatment of textile industry wastewater is investigated. The COD of the textile wastewater is analyzed to found as mg/L. The wastewater of textile industry is treated with different intervals of time as 30mints, 1hour and 24 hours respectively. The percentage reduction of COD by Fenton treatment was also carried out in experimental conditions. Maximum percentage of was 30 mins (63 mg/l). In both cases i.e, 1hr, 24hr, COD reduction in Fenton treatment, there is a significant reduction more or less i.e., (51mg/L and 50mg/L). Next the toxicity of textile effluent on growth of plant system was investigated. The average root length, percentage root length, root enhancement and EC_{50} of Allium cepa were measured at end of 5 days. The percentage reduction of *Allium cepa* growth with 5%, 10%, 20%, 50%, 75%, 100% of textile industry effluent and EC_{50} value was found to be 18%. The percentage root length reduction and EC50 of onions bulbs were measured based on the changes in root length at the end of 5 days. The industry and Fenton treatment showed the growth effect on *Allium cepa* on root length in concentration dependent manner. The percentage of *Allium cepa* root length reduction growth with control (aquagaurd water) 5%, 10%, 20%, 50%, 75%, 100% of textile wastewater were 0, 16 ,33.2, 52, 70.8, 88, 96.08 as percentage root growth (100, 84, 66.8, 48, 29.2, 12, 3.2). The root length of *Vigna radiata* were measured to check the effect of the effluent at the end of 5days. And compared with the root growth presence of 30mins, 1hour, and 24 hours Fenton treated textile industry effluent. The growth obtained are 2.35±0.3cm, 1.5±0.4cm, and 2.15±0.2cm, compared to untreated effluent of 1.9±0.3cm. From this it could be observed that the effect of industrial textile wastewater is related with the physicochemical characteristics of the wastewater.

Key words: COD, TDS, Salinity, Conductivity, Fenton treatment, Allium cepa, Vigna Radiata

MAGNETOHY DRODYNAMIC STAGNATION POINT FLOW AND HEAT TRANSFER EFFECTS OF AL_2O_3—CU/ WATER HYBRID NANOFLUID OVER A POROUS STRETCHING SURFACE

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Abstract: In this article, the heat transfer analysis of an unsteady free convection flow of a hybrid nanofluid over a porous stretching sheet subjected to the uniform magnetic field is investigated. The effects of radiation and heat source/sink are taken into consideration. Two different types of nanoparticles namely, Aluminum oxide (Al_2O_3) and Copper (Cu) are considered. The unsteady free convection flow of nanofluids over a stretching surface has vast applications in heat exchangers technology, next generation solar film collectors, geothermal energy storage etc. In view of this we considered the time dependent governing equations. The set of non-linear equations (PDEs) are changed into ordinary differential equations with the help of similarity transformations. The transformed equations are solved by using MATLAB bvp4c shooting technique. The obtained results are presented and analyzed through graphs and tables. From the results, it is noticed that the free convection parameter enhanced the fluid velocity and temperature in both nanofluid and hybrid nanofluid cases. It is noticed that the hybrid nanofluid has the highest temperature distribution than the nanofluid. It is further observed that, the fluid flow is substantially influenced by the variations in unsteadiness parameter.

Keywords: Magnetohydrodynamics; Hybrid Nanofluid; Free convection; Unsteady flow; Porous stretching sheet.

PROFIT MAXIMIZATION IN AN INVENTORY MODEL FOR DECAY ITEMS WITH PRICE AND ADVERTISEMENT-DEPENDENT DEMAND

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Abstract: Proper mathematical modeling and controlling of inventories play a vital role in profit maximization or expenditure minimization for a successful business. In case of new products and new markets, advertisements are helpful to boost inventory demand by changing the customer mindset. Customer demand is also depending on the price of a commodity. This paper develops a mathematical model for an EOQ inventory system with non-instantaneous perishable items with two-staged demand. The demand rate depends only upon the price and frequency of advertisement in the first part of the cycle. In the second part, demand is time proportional also. Inventory items are perishable with a time-dependent deteriorating rate. Shortages are not permitted. Optimal inventory decision policies have been derived by maximizing the average inventory system profit with a simple solution procedure. Numerical example is illustrated with sensitivity analysis.

Keywords: EOQ; Perishable items; Price, Advertisement and time-dependent demand; Time-dependent deteriorating rate.

EVALUATION OF ANXIOLYTIC AND ANTIDEPRESSANT ACTIVITY CARRIED OUT FOR MELIA AZEDARACH LINN. LEAF EXTRACTS OF METHANOL, CHLOROFORM, AND HEXANE

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Abstract: Present study was planned to search for neuropharmacological properties of different extracts of leaves Melia azedarach Linn. Because conventional medicine shows adverse effects. Recently natural products are studied worldwide, as safer alternatives, which are not duly supported with scientifically proved data. Melia azedarach (Bakayan, China berry tree) is medium sized tree belonging to family Meliaceae. Folk medicinal use of plant is as antimicrobial and blood purifier. Externally oil used to cramps and rheumatism. Methanolic extract of leaves (MEL), chloroform extract of leaves (CEL) and hexane extract of leaves (HEL) were the test drugs to study different activities on NMRI mice. This is the first report regarding CNS activity of Melia leaves. Significant anxiolytic activity (p=0.000) (MEL), (HEL and CEL) (p=0.002) was estimated by "elevated plus maze" and "Light and dark activity box". Antidepressant activity was seen by HEL (p=0.000) in "forced swim test". Diazepam and Imipramine were used as positive controls respectively. In conclusion leaf extract have shown very powerful anxiolytic and anti-depressant activity and cytotoxic potential of HEL cannot be ruled out.

Keywords: Melia azedarach Linn., Elevated plus maze, Light and dark box, Forced swim test, anxiety, depression.

STRUCTURAL AND OPTICAL PROPERTIES OF DY^{3+} DOPED PVA/PVP BLEND POLYMER FILMS

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Abstract: The purePolyvinyl alcohol (PVA)/Polyvinyl pyrrolidone (PVP) polymer blend and various (0.0 to 0.3wt%)concentrations of Dy^{3+} doped PVA/PVP blend polymer films have been preparedby solution cast method. X-ray diffraction (XRD), Fourier transforms infrared (FTIR), and Photoluminescence (PL) were used to study the spectral properties of prepared polymer films.The semicrystalline nature was revealed by XRD analysis. FTIR spectroscopy was used to investigate the structural details and mechanisms of ion-polymer interactions. From the PL emission spectra two strong emission peaks at 476 nm (blue), 571 nm (Yellow)corresponding to $^4F_{9/2} \rightarrow {}^6H_{15/2}$ and $^4F_{9/2} \rightarrow {}^6H_{13/2}$ electronic transitions.These white light-emitting transparent polymers are extremely useful for a wide range of photonic applications.

Keywords: PVA/PVP: Dy^{3+} blend polymer films, XRD, FTIR and Photoluminescence

EFFECT OF CATION MIGRATION ON THE STRUCTURAL, SPECTROSCOPIC AND MAGNETIC PROPERTIES IN CR SUBSTITUTED $COFE_2O_4$

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Abstract: For the first time, we present the structural and magnetic properties of Cr substituted $CoFe_2O_4$ ($Co_{1-x}Cr_xFe_2O_4$ with $0 \leq x \leq 0.25$), polycrystalline samples synthesized by wetchemical method. Rietveld refinement on X-ray diffraction patterns confirms the formation of single phase cubic single spinel structure. Presence of Cr in substituted $CoFe_2O_4$ was confirmed by the energy dispersive spectroscopy studies. Shifting of peaks corresponding to metal-oxygen bonds towards higher wavelength region was observed from Infrared spectrum. Broadening of Raman peaks exhibited the existence of local disorder due to the inter-site cation migration in tetrahedral and octahedral sites in a complete agreement with Mössbauer results. The samples show ferri magnetic behavior at room temperature. Saturation magnetization shows a scaling behaviour with Cr substitution. Large coercivity is observed at specific concentrations of Cr which is strongly dependent on magnetocrystalline anisotropy. Microstructural parameter based on Stoner-Wohlfarth (SW) relation complements the structural disorder of these alloys.

HALF METALLIC CO-BASED FULL HEUSLER ALLOY FOR SPINTRONIC DEVICE APPLICATIONS

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Abstract: This work, presents the results of Co_2MnAl full Heusler alloy nanoparticles prepared by solid state reaction method. In general, Heusler alloys are ternary intermetallic alloys with half metallic behavior that is the majority spin band shows metallic behavior and minority spin band exhibits semiconducting bahaviour with a band gap at the Fermi level which leads to 100% spin polarization. The x-ray diffraction pattern indicates prepared alloy is in polycrystalline nature with cubic structure. The surface morphology was examined using field emission scanning electron microscope and the presence of Co, Mn and Al were confirmed using energy dispersive x-ray spectroscopy. Thermal stability was investigated using thermal analysis techniques. Using vibrating sample magnetometer magnetic properties were studied. The prepared alloy exhibits soft ferromagnetic nature with low coercivity H_c=21.70 Oe. This ability of the alloy to sense very weak magnetic fields at room temperature can be used in the giant or tunneling magnetoresistance and also in magnetic random access memory devices. These results imply that Co_2MnAl full Heusler alloy is a promising candidate for spintronic device applications.

keywords: Heusler alloy, Half-metallic, Nanoparticles, Soft Ferromagnet.

AN APPLICATION OF NETWORK MODELS IN FINDING THE SHORTEST PATH BETWEEN TOURISTS' DESTINATIONS IN DELHI VIA METRO

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ABSTRACT: New Delhi, the capital city of India, is an epitome of cultural richness, prestigious heritage and divine architecture which attracts millions of foreign tourists annually. This study aims to address the difficulties of those tourists by finding the shortest possible pathways with respect to time to cover seven major tourist destinations, namely - Red Fort, Qutub Minar, Lodhi Garden, Lotus Temple, India Gate, Jama Masjid and Akshardham Temple starting from the terminal 3, the international terminal of Indira Gandhi International Airport, New Delhi using Dijkstra's Algorithm and Prim's Algorithm. The study utilises the metro as a mode of transportation and considers the nearest metro station to the mentioned tourist places as a proxy to the final destinations. This research, executed using python programming language, was conducted on data extracted from the Delhi metro website owned by the Delhi Metro rail corporation. The study concludes that the minimum-transportation time taken to cover all 7 mentioned destinations will be 111 minutes with the first destination as Red Fort, followed by India Gate which is connected to Qutub Minar, Jama Masjid, Akshardham and Lodhi Garden. Finally, one can reach Lotus temple from Lodhi Garden when choosing the least distance option. The shortest time to travel to each of the above-mentioned destinations from Terminal 3 of the airport are 30 minutes, 56 minutes, 44 minutes, 56 minutes, 33 minutes, 41 minutes, and 47 minutes respectively.

Keywords: Dijkstra's Algorithm, Prim's Algorithm, Shortest path, Delhi metro

MHD BOUNDARY LAYER FLOW OVER A MOVING VERTICAL POROUS PLATE WITH SORET AND DUFOUR EFFECTS

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ABSTRACT: The aim of the present paper is to investigate the effects Soret and Dufour on MHD boundary layer flow over a moving vertical porous plate with suction. The physical phenomena is described by a set of coupled non-linear ODEs by using similarity variables. These equations are solved numerically using Runge-Kutta-fourth order shooting method. Comparison is made with existing literature and numerical values are in excellent agreement. The effects of various emerging parameters on the flow are analyzed and discussed through graphs in detail. The values of the skin friction coefficient, Nusselt number and the Sherwood number for different physical parameters are also tabulated.

Key words: Boundary layer, Heat and Mass transfer, Soret effect.

EFFECT OF CHEMICAL REACTION ON MHD BOUNDARY LAYER FLOW OF A NON-NEWTONIAN FLUID

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This paper describes the impact of chemically reaction in boundary layer flow of a Casson fluid in the presence of porous medium. The similarity variables are used to convert governing equations into a system of ODEs and are then computationally addressed using shooting method. The results are investigated numerically through graphs for velocity, temperature and concentration distributions. Numerical outcomes are compared with available results which are in good agreement. The outcome of this work showed that Casson parameter reduces thevelocity field while as the temperature is temperature is improved with increasing Casson parameter.

Keywords: Casson Parameter, Non-Newtonian fluid, porous medium

COMPUTATIONAL ANALYSIS OF NON-NEWTONIAN MAGNETIC POLYMER FLOW IN A CURVED SURFACE

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Abstract: There has been a growing interest in new electro-conductive polymer materials which feature smart characteristics that can be manipulated by for example external magnetic fields. These materials are increasingly being utilized in coating manufacturing processes. In view of these applications, in the current article studiesthe magnetohydrodynamic non-Newtonian boundary layer flow and heat transfer from a curved stretching surface under a static radial magnetic field. The Reiner-Rivlin second grade viscoelastic model is deployed. High temperature invokes the presence of radiative heat transfer which is simulated with the Rosseland diffusion approximation. Viscous dissipation and Joule heating are also featured in the model and hydrodynamic (velocity) slip at the wall is also incorporated in the boundary conditions. The emerging nonlinear coupled dimensionless transport equations are solved with a Runge-Kutta method and a shooting numerical scheme. The performance of flow parameters on the dimensionless profiles are examined with the help of plots for comparative analysis of both non-Newtonian fluid and Newtonian fluid. The numerical solutions are validated for special cases with existing works. The velocity declines for higher magnetic field whereas the reverse trend is noted for the temperature function. An augmentation in thermal field is noted with increment in radiation parameter. Furthermore, the fluid temperature of second grade fluid is higher with increasing Brinkmann number. Wall slip induces deceleration. Contour plots for streamlines and isotherms are also visualized and analyzed.

Keywords: MHD, thermal radiation, second grade fluid, curved surface, electroconductive polymer processing.

SLOW STEADY MOTION OF A SECOND ORDER THERMO-VISCOUS FLUID BETWEEN TWO PARALLEL PLATES

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ABSTRACT:

The slow steady motion of a second order thermoviscous fluid between two parallel plates is examined when thermo-stress coefficient is far less compared to strain thermal conductivity coefficient and coefficient of cross viscocity , for following two cases (i) when upper plate is in relative motion and (ii) when upper plate is thermally insulated. It is observed that forces are generated in transverse directions which is special feature of these type of fluids.

Keywords : Theromoviscous fluids, Strain thermal conductivity, Thermo stress Coefficient, heat flux bivector.

ACTIVATION PROCESS AND SORPTION PROPERTIES ANALYSIS OF NEG MATERIALS

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Abstract: This article briefly describes the preparation of Ti-Co and Zr-Co NEG alloys with the elemental composition $Ti_{700+x}+Co_{297-x}+(Sm+Gd)_3$ and $Zr_{700+x}+Co_{297-x}+(Sm+Gd)_3$. These are made using a traditional solid-state reaction process and activated at a temperature of 1000^{o}C. These are analyzed with X-ray Diffraction (XRD) for structural analysis, Field Emission Scanning Electron Microscope (FESEM) with Energy Dispersive Spectroscopy (EDS) for morphological and elemental concentration analysis, Transmission Electron Microscopy (TEM) for micro-structural and average particle size analysis, Thermogravimetric Analysis (TG/DTG), and Differential Scanning Calorimeter (DSC) for gas absorption or desorption characteristics studies. The main objective of this research is to investigate the activation process and the gas absorption or desorption (sorption) investigations of the Sm and Gd substituting rare-earth components in Ti-Co and Zr-Co NEG alloys. X-ray photoelectron spectroscopy (XPS)studies have been performed for surface analysis of the present materials and to understand chemical modificationon the surface of the getter material.

Keywords: Vacuum, Ti-Co, and Zr-Co NEG materials; absorption; desorption; thermal analysis.

EXPLORING THE INFLUENCE OF ZINC SUBSTITUTION ON STRUCTURAL, PHYSICAL, MAGNETIC AND DC RESISTIVITY PROPERTIES OF $CO_{0.5}CU_{0.5}FE_2O_4$NANO-FERRITES

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Abstract: High coercivity and saturation magnetization are well-known properties of the hard magnetic material cobalt ferrite ($CoFe_2O_4$). There are enormous prospects for a variety of biological, electrical and recording applications due to many of these hard magnetic properties. The studies of $Co_{0.5}Cu_{0.5-x}Zn_xFe_2O_4$(x = 0, 0.1, 0.2 and 0.3) samples using thermo-gravimetric, X-ray diffraction, scanning electron microscopy and infrared technology are reported in this work. The biggest exothermic peaks were initially observed between 300 and 400 °C, and they were attributed to mass loss from the thermo-gravimetric breakdown of the nitrate and citrate content. At (111), (220), (311), (222), (400), (422), (551) and (555), X-ray powder diffraction patterns can be seen reflecting (440). It is discovered that the transmission bands fall within the range that was anticipated based on the spectra. The produced compounds are equivalent in terms of morphology and particle size, but they are somewhat aggregated as a result of interactions between magnetic Nano-ferrites. Because the porosity decreases with increasing dopant concentration, the coercivity values of the synthesized samples rise with copper content. Each compound's resistance decreases as temperature rises, indicating that all samples exhibit semiconducting characteristics.

Keywords: Cation distribution, X-ray diffraction, transmission bands, grain size, Coercivity.

BIOREMEDIATION OF CONTAMINATS IN SOIL - A REVIEW

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ABSTRACT: Environmental pollution is a major problem which leads to many health hazards. Over 12 million people's lives lead to death due to the contaminants in the soil. Chemical solvents, paints, pharmaceutical leftovers and industrial byproducts, petroleum hydrocarbons, and other pollutants are the most frequently emitted, and they all have a harmful impact on the environment. Bioremediation is an effective cleansing method to get rid of harmful waste from a damaged environment. Bioremediation is the best technique to deal with the contaminated soil. It is inexpensive and more efficient than many other techniques. It is a waste management technique that employs living organisms to remove or neutralize contaminants from polluted sites. Bioremediation focuses on biological processes to lower, eliminate, mineralize, or change pollutant concentrations to a non-harmful or non-toxic condition. Bioremediation uses microorganisms, fungi, green plants or their enzymes to return to the natural environment. Bioremediation helps in regenerating of soil, ground water and removes the pollutants from its non-toxic nature in air. Avoiding use of harmful pesticides,non-biodegradable materials and industrial waste dumps into the seas results in a healthy environment. We tried to brief the various advancements of the bioremediation process to remove the contaminants.

KEY WORDS: Bioremediation, hydrocarbons, microorganisms, industrial waste.

SYNTHESIS AND PROPERTIES OF EU DOPED CDZNS NANOPARTICLES AT ROOM TEMPERATURE

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Abstract: Undoped and various concentrations of Eu^{3+} (10, 20& 30) doped CdZnS nanoparticles have been synthesized by a co-precipitation method. The optical and morphological properties of synthesized nanoparticles were studied by various methods such as XRD, TEM and EDAX.This study showed that the formation of Eu^{3+} doped CdZnS. The cubic crystal structure of the synthesized nanoparticles is revealed by X-ray diffraction analysis.The formation of Eu_2O_3 is confirmed by XRD at higher doping concentrations of Eu from 10 to 20%.The morphology and chemical composition were evaluated using microscopic analysis (TEM) and the EDAX spectrum, and it was noticed that the particle size is around 10 nm.

Keywords: CdZnS: Eu^{3+}, XRD, TEM and EDAX.

SYNTHESIS AND MAGNETIC PROPERTIES OF CR SUBSTITUTED MG-ZN SPINEL FERRITES

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Abstract: In this study, soft ferrites Mg1-xZnxFe2-yCryO4 (x = y = 0.0, 0.2, and 0.4) were synthesized by using the solid-state reaction method. They were measured for their structural, morphological, vibrational, and magnetic properties using XRD, SEM, FTIR, and VSM, respectively. It was examined that the ferrites all have cubic spinel structures. These materials have a uniformly spherical morphology.As a result, increasing in magnesium concentration decreased, changes the various magnetic parameters like magnetic moment, anisotropy, coercivity, saturation magnetization etc. that are applicable in our daily life.

Keywords: Spinel ferrites; Xrd; Sem; Magnetic properties.

MAGNETIC AND DC ELECTRICAL RESISTIVITY PROPERTIES OF CU DOPED MG0.6-XNI0.4CUXFE2O4 FERRITE

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Abstract:

Cu doped Mg0.6-xNi0.4CuxFe2O4 (x = 0.0, 0.1, 0.2 and 0.3) ferrite materials with spinel structure have been prepared by solid-state reaction method. For their characterization, we have used X-ray diffraction (XRD) to examine structural parameters, Scanning electron microscopy (SEM) with EDS to study morphology and composition, Fourier transform infrared spectroscopy (FTIR) to identify the characteristics absorption bands, Vibrating sample magnetometer (VSM) to deal with magnetic parameters, and Two-probe measurement technique for DC resistivity. The XRD pattern and two definite absorption bands given by FTIR in between 400 cm−1 - 600 cm−1 revealed a single-phase cubic spinel structure formation of the synthesized materials. The increment in Cu concentration increased the lattice constant as a result of the larger ionic radius of this substituent than that of Mg ion. The distribution of cations to the octahedral and tetrahedral positions affects the hopping mechanisms that ultimately influence the features related to resistivity and magnetism.

Keywords- Cu substitute Mg-Ni ferrite; X-ray diffraction; Vibrational Spectrometer; SEM; VSM

MG AND CA CO-DOPED ZNO NANO-PARTICLES AND IT'S OPTICAL PROPERITES

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Abstract: Mg and Ca co-doped ZnO nanoparticles ($Zn_{0.95-x}Mg_{0.05}Ca_xO$) with different doping concentrations (x=0, 0.01, 0.02, 0.03, 0.04 and 0.05) were prepared using Sol-Gel method. From Raman Spectral analysis it was confirmed that the particle size of ZnO nanoparticles reduced with increase of doping concentrations of Mg and Ca. The exciton peaks observed from Optical absorption studies were situated at 377 nm for undoped and with dopants it was blued shifted to 361 nm. These absorption peaks were attributed to n=1 excitonic states. The blue shift observed is attributed to the incorporation of the dopant elements

MAGNETIC AND DC ELECTRICAL RESISTIVITY PROPERTIES OF Co SUBSTITUTED Ni-Cu-Zn NANOFERRITES

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The polycrystalline ferrites are very good dielectric materials are very useful for microwave applications; ferrite cores; ferrite memory cores. Co substituted Ni-Cu-Zn ferritefilms are applied to electromagnetic noise suppressors which directly cover noise source elements on printed circuit boards.Thesol-gel auto-combustion method has adopted to prepare$Ni_{0.4-x}Co_xCu_{0.2}Zn_{0.4}Fe_2O_4$, nanoferrites system by FE-SEM, EDS, FTIR, dc resistivity and magnetic (VSM) property methods.This method is simple and can be used with little chemical knowledge. The influence of Co ions substitution brought appreciable changes in the magnetic and dc electrical properties of the NiCuZn nanoferrites system.RoomTemperature (300K) hysteresis loops of all samples in the applied field range -10 to +10 KOe. Saturation magnetization (Ms) decreases from 90.71 (x=0.0) to 40 emu/g (x=0.1) and increased to 57 emu/g for x=0.2 with increasing Co in content. Hc increases initially 1778 Oe (x=0.0) and reaches a maximum value 408 Oe (x=0.1) and then decreases to 120 Oe (x=0.2). A flat permeability profile was observed for all samples under study up to 50 MHz, exhibiting good frequency stability. The dc resistivity increases initially for x=0.1 and then decreases continuously with increasing Co concentration. DC electrical resistivity of all the samples exhibits semiconductor like behaviour, i.e., reducing resistivity with increasing temperature for all the samples. From the results of DC resistivity measurements, it is observed that the resistivity decreases with an increase in temperature for NiCuZn nano ferrites suggesting the semiconducting behaviour of the samples. The activation energy in the ferromagnetic region is in general less than that in the paramagnetic part.

Keywords: Ni-Cu-Zn ferrite, FE-SEM, EDS, FTIR, Saturation magnetization (Ms), DC electrical resistivity.

RESTORATION OF URBAN DRAINAGE WASTE WATER WITH DECENTRALIZED: PHYTORID BASED WASTE WATER TREATMENT SYSTEM

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Abstract

Water Scarcity and wastewater managements are two major challenges that affect the ecosystem and the urban environment. In a tropical country such as India, wastewater reuse should be encouraged whenever it is safe and economically feasible. There are many methods for wastewater treatment. This project methodology consists of a theoretical study about water reuse, treatment and constructed wetlands. Adequate water and wastewater management, essential for human health and economic development, poses a major challenge to many countries around the globe. Whereas in the industrialized countries water and wastewater control had reached a fairly high standard, in developing countries severe problems with respect to water supply and wastewater management are still apparent. Water supply systems, even though we have wastewater treatment techniques but we are not able to implement on site because of high installation cost and need skilled man power it is difficult to maintain. So the wastewater treatment lags behind and remains a major challenge. So there is a need to develop suitable low cost and eco-friendly technology for the urban sewage wastewater treatment which is easy to implement and maintain. By achieving wastewater reuse the waste lands and barrel lands are turn in to gardens and forest lands for future sustainability.

Key words: wastewater managements, economically feasible, constructed wetlands, water supply, wastewater treatment, sustainability.

SOL-GEL SYNTHESIS OF $CAZNAL_2O_4$ CERAMIC NANOPARTICLES AND INVESTIGATION OF THEIR PROPERTIES.

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Abstract: Dielectric ceramic materials are well-recognized in the semiconductor industry because of their unique properties such as thermal stability, chemical resistance, and crystallinity. Despite their potential applications, these are also demanded in wireless communication. This paper reports the structural, morphological, and dielectric properties of sol-gelderived $CaZnAl_2O_4$ceramic nanoparticles. X-ray diffraction (XRD) analysis exihibited the polycrystalline characteristic of the $CaZnAl_2O_4$nanoparticles withtheir crystallite size of 13nm. We have investigated the functional groups present in the ceramic nanoparticles, which confirmed the relevant vibration peaks of various functional groups. Surface morphology study demonstrated the preparation of spherical grains with their mean diameter of 16nm. The concentric rings also confirm the crystallinity of the nanoparticles that appeared in the selected area diffraction pattern. Furthermore, we analyzed the nanoparticles' dielectric properties, which showed the variation of dielectric permittivity from 23.76 to 21.67 as a function of increased frequency. Similarly, the dielectric loss is found to decrease from 0.047 to 0.039. As a result, the conductivity increased from 1.324 μS/m to 3.639 μS/m as a function of applied frequency.

Keywords:Ceramics, Nanoparticles, sol-gel method, crystallinity, dielectric properties.

TRIAZINE-BASED COVALENT ORGANIC CAGE MATERIALS FOR CO2 GAS ADSORPTION APPLICATIONS.

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Abstract

A series of imine-linked Triazine-based organic cage molecules (COC-1, COC-2, COC-3, and COC-4) were synthesized by varying the amine precursor (ditopic amines) molecules through dynamic covalent chemistry of a reversible process and studied the CO2 gas sorption characteristics. By changing amine precursor molecule, tuning of the structure, and the porosity of the cage molecules were demonstrated. The CO2 gas sorption capacities of all these cages were measured at 273K and 298K. Among all these cages, COC-3 showed the greater surface area (63.430 m2 g-1) with high CO2 sorption capacity of 12.0 cm3 g-1 at 273K, and 8.09 cm3 g-1 at 298K, at 1 bar pressure.

Keywords: Covalent organic cage, CO2 adsorption, Schiff-base condensation, Triazine linker.

STRUCTURAL, ELECTRICAL AND MAGNETIC STUDIES OF $NI_{0.7}MN_{0.2}CU_{0.1}FE_{2-X}AL_XO_4$ (X=0, 0.05, 0.1, 0.15, 0.2 AND 0.25) NANO-FERRITE SYNTHESIZED BY SOL-GEL TECHNIQUE

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Abstract:

In this research analysis, the outcome of aluminum substitution on the structural, magnetic, electric and dielectric features of spinel ferrite is studied. The nano-ferrites $Ni_{0.7}Mn_{0.2}Cu_{0.1}Fe_{2-x}Al_xO_4$ with x=0, 0.05, 0.1, 0.15, 0.2 and 0.25 are contrived by sol-gel auto-combustion technique. The spinel phase of the synthesized materials is identified by using the XRD diffraction pattern and gives a good confirmation for the development of ferrite. The SEM studies reveal about the uniformity of the materials and the spherical shape of the grains. The IR spectra reveal replacement of Al^{3+} ions which broaden and shift the ν_2 band suggesting the occupation of Al^{3+} ions on octahedral B-location. Relative permittivity and dielectric loss tangent decline with aluminum concentration rise for every synthesized ferrite. VSM is employed to study the magnetic behavior of the samples at room temperature.

Keywords: Cation distribution, force constant, magnetic moment, electron spin resonance

FACILE GREEN SYNTHESIS OF AG- ZNONPS USING CITRUS MEDICA L. FOR ABATEMENT OF WASTE WATER TREATMENT, ANTIBACTERIAL ANDANTI OXIDANT ACTIVITIES.

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Abstract: Green synthesis is a straightforward, non-toxic, cost-effective, and environmentally acceptable method for making nanoparticles. The present study used an aqueous solution of Citrus medica L. leaf extract as a capping agent to make Silver@ Zinc dioxide nanoparticles (Ag@ZnO NPs). The photo catalytic removal of lead from industrial effluent was tested using these green produced Ag@ZnO NPs. High-resolution scanning electron microscopy (HRSEM), high-resolution transmission electron microscopy (HRTEM), X-ray energy dispersive spectroscopy (EDS), Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), dynamic light scattering (DLS), and Brunauer-Emmett-Teller spectroscopy were used to characterise the nanoparticles obtained (BET). The results showed that produced Ag@ZnO NPsNPs have a spherical morphology with an anatase phase and a large BET surface area of 104 m2/g. In a self-designed reactor, photo catalytic investigations of Ag @ZnO NPs for lead removal from explosive wastewater were conducted. The concentration of lead was determined using inductive coupled plasma spectroscopy (ICP). Chemical oxygen demand (COD) was reduced by 74.5 percentand lead (Pb^{2+}) was reduced by 82.53 percent, according to the findings. This is the first time that green Ag@ ZnO NPs have been used in this way.Ag@ZnO NPsnanoparticles; photo-catalytic degradation; wastewater treatment.

Keywords: green synthesis; Citrus medica L. I extract; Ag@ZnONPs nanoparticles; photo-catalytic degradation; wastewater treatment

STUDIESONPHOTOLUMINESCENCE PR3+ AND DY3+ DOPED P2O5 -CDO-MGO-PBF2 GLASSES

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ABSTRACT: Spectroscopic investigations of crystals, glasses and solutions doped with lanthanide (Ln) ions play an important role in science and technology especially in laser physics, lighting applications. P2O5 glasses have several advantages over conventional silicate and borate glasses due to their superior physical properties such as high thermal expansion coefficient, low melting and softening temperatures, and high ultraviolet transmission. These glasses have potential industrial and scientific applications. Phosphate glasses are structurally interesting because they accept a wide range of ion substitution. The rare earth (RE) doped glasses have been widely investigated because of their versatile applications in fabricating lasers, upconverters, optical amplifiers and storage devices also. The host glass plays an important and interesting role in the development of RE doped optical devices. In view of the above applications extensive research has to be carried out for the search of new hosts doped with RE ions.

Key words: XRD, Emission, Excitation, Raman Spectra.

FOURTH-GRADE FLUID FLOWING PERISTALTICALLY IN A PLANAR CHANNEL: EFFECTS OF SLIP AND HALL FRICTION

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Abstract: Under the suppositions of a long wavelength and a low Reynolds number, the effects of slip and Hall on the peristaltic motion of a conducting fourth-grade fluid through a porous media in a planar channel are explored. Examining the flow involves travelling with the wave's speed in a frame of reference for waves. Explicit forms of the velocity field and the relationship between flow rate and pressure gradient are obtained using the perturbation series in the material parameter($\Gamma < 1$). With the use of graphs, the axial pressure gradient and the pumping characteristics are analyzed in relation to the fluid's material parameter, the slip parameter, the Darcy number, the Hartmann number, and the Hall parameter. Furthermore, it is discovered that the pumping is more appropriate for fluid from the fourth grade than for a Newtonian fluid.

Key words: Planar channel, Peristaltic, Fourth-grade fluid, Slip and Hall friction.

MATHEMATICAL SCIENCES AND OTHER FIELDS: CONNECTIONS

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Abstract : In addition to an increase in the number of mathematical sciences subfields being used to address problems outside the discipline, the current study also discovered a startling rise in the influence of the mathematical sciences on other fields. This expansion has been going on for years, but in the last 10 to 20 years it has really picked up speed. Some of these connections emerge organically as a result of the fact that so much of modern science and engineering is based on computation and simulation, for which the mathematical sciences serve as the native language. Furthermore, data gathering capabilities have greatly increased and are continually growing, and the mathematical sciences are inherently involved in extracting knowledge from all of those data. But there is room for improvement in the systems that allow scholars in other fields to connect with mathematicians. The concept of the mathematical sciences has become more inclusive as a result of increased contact with other disciplines, as discussed in this paper. Following that, it presents evidence of the value of mathematics to a wide range of disciplines. This relevance may frequently be demonstrated by looking at significant studies conducted by the fields themselves, which frequently name issues having a significant mathematical science component as among their highest priorities.

Key words: Mathematical Science, Connections, Other Fields.

IMPROVING QUALITY OF AIR - PHYTOREMEDIATION

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ABSTRACT: Phytoremediation is the use of plants and the microbes for the cleanup of contaminants in the environment. Phytoremediation has been recommended as being a cost effective, environmentally friendly alternative technological innovation. A great package of research implies that plants have genetic potential to be able to remove many dangerous metals from the soil. The majority of the world's population will be exposed to extremely polluted air problems, leading to various human diseases. To conquer this particular plants are usually possible applicants in order to remove pollutants via diverse biological systems involving accumulation, immobilization, volatilization, and degradation. Numerous plant species eliminate indoor and outdoor air pollutants, based on their morphology, development condition, and microbe's communities. Hence, suitable plant selection together with optimized growth problems can boost the remediation capacity significantly. Interior plant cultivation has the potential to enhance quality of air flow by removing particulate air pollutants. Plants within individual containers are apparently more efficient for use inside in comparison to a bio filtration wall or big filtration. There are usually several reports on using specific plants for efficient phytoremediation of indoor air flow pollutants.It is a relatively new invention that has gained popularity due to its affordability, effectiveness, originality, environmental friendliness, and solar-powered design. Plant metabolism can help to remediate or clean up contaminated sites.

SYNTHESIS OF NEW SCHIFFS BASES IN AQUEOUS MEDIUM UNDER ULTRASONICATION METHOD

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Abstract: Schiff's bases are very important class of compounds especially in the field of pharmaceutical and medicinal industry. The synthesis of schiffs bases requires long reaction times and use of organic solvent in conventional methods. Here in we report the synthesis of new shiffs bases under ultrasonication method. It is experimentally good, clean, and high yielding and lower reaction times when compare to conventional method. The reaction mixture was separated by filtration and washed with hot water and hexane. The new compounds were charcteresized by spectral data (IR, ^{1}H, and^{13}C NMR and mass) techniques.

Key words: Schiff's bases, aqueous medium, Green synthesis. Ultrasonication method.

SYNTHESIS AND OPTICAL PROPERTIES OF PR AND NI CO-DOPED ZNO NANOPARTICLES PREPARED BY CHEMICAL CO-PRECIPITATION METHOD

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ABSTRACT: ZnO nanoparticlesco-doped with Pr and Ni were successfully synthesized at room temperature using the chemical co-precipitation method. Ni doping in ZnO is a good method for tuning of band gap.Doping of nickel(Ni) inZnO:Pr enhances the photoluminescence.The X-ray diffraction patterns confirmed the wurtzite hexagonal structure without disturbing the lattice constant. Morphological and compositional studies were caried out by SEM attached with EDAX. And Effective doping of Pr and Ni were observed in EDAX spectra.The growth of particle size decreases from 32 nm to 24 nm with increasing the concentration of Ni With increasing Ni dopant concentration, reduction in Optical bandgap was observed. Hence, Pr, Ni co-doped ZnO nanoparticles may find photodiode applications.

Keywords: Chemical precipitation, XRD, SEM, EDAX, DRS.

STRUCTURAL, MORPHOLOGICAL AND COMPOSITIONAL ANALYSIS OF EU AND NI CO-DOPED ZNS NANOPARTICLES

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Abstract: Chemical co-precipitation was used to successfully synthesize un-doped and (Cu, Ni) co-doped ZnS nanoparticles.According to the XRD results, the synthesized samples have a cubic blended structure.Pure and (Eu, Ni) co-doped ZnS have average crystalline sizes of around 3-14 nm.The crystal structure of ZnS does not change with Eu and Ni co-doping, and even though crystalline size enhances by increasing Ni (0, 2, 4 & 6 at.%) while keeping Eu at 4 at.% constant. Transmission electron microscopy confirmed these findings (TEM). The crystalline size of the TEM samples is 3-5 nm, which is consistent with the XRD results.The micrographs of the (Eu, Ni) co-doped nanoparticles in SEM and TEM are spherical with agglomeration.The EDAX spectra show that the chemical composition of the samples is stoichiometric to ZnS.

Keywords: precipitation method, XRD, SEM, TEM, EDAX

FLOW ANALYSIS OF HYBRID NANOFLUID UNDER HEAT SOURCE/SINK IN CONDUCTING FIELD

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Abstract: The characteristics of MHD hybrid nanofluid flows past an upright porous plate under the existence of heat source and thermal radiation is examined thoroughly. An exact solution has been gained for fluid velocity and temperature from the partial differential equations that govern the flow. The solution in exact form is obtained by applying Laplace transform technique. Graphical representations and numerical table values are taken and analyzed the flow properties under the influence of considered physical parameters. The examination is carried out by comparing the nature of the flow in respect of hybrid nano fluid and usual nanofluid.

Keywords: Hybrid nanofluids, Conducting field, Laplace transform technique, thermal radiation, heat source.

STRUCTURAL AND OPTICAL PROPERTIES OF CR DOPED ZNS NANOPARTICLES.

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ABSTRACT: Chromium (Cr+3) doped ZnS nanoparticles have been synthesized at room temperature with PVP (Poly Vinyl Pyrolidine) capping agent by using chemical co-precipitation method. The prepared samples were characterized by XRD, UV-visible (UV–vis) spectrophotometry, and SEM with EDX. XRD analysis confirmed that the cubic zinc blend structure of ZnS nanoparticles and the average crystallite size is in range (2.034 ~1.96nm). UV–vis spectrophotometer confirmed that the optical bandgap was increased with increase doping concentration. The EDX reveals that only two elements Zn, S exist in pure ZnS and also it reveals that only three elements, Zn, S, and Cr element exist in Cr-doped ZnS nanoparticles. The SEM images show that the particles were agglomerated and ZnS nanoparticles were nearly spherical in shape.

Key words: ZnS nanoparticles, Precipitate, XRD, SEM with EDX, UV-Vis.

ANALYSIS OF DOUBLE DIFFUSION EFFECTS ON MHD CASSON FLUID OVER A STRETCHED SURFACE

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Abstract. This research investigates the effect of thermal radiation on the MHD stagnation point flow of Casson liquid over a stretched surface with varying temperature and concentration. The nonlinear coupled governing equations can be turned into a set of nonlinear ordinary differential equations by employing similarity transformations. The set of nonlinear equations and boundary conditions are computationally solved using the shooting technique. It is shown and discussed in great detail how various flow field parameters affect momentum, heat measurement, diffusion, rate of heat transfer, skin friction coefficient and rate of mass transfer. Futher, the numerical outcomes of this study matched with previously published outcomes and the results were determined to be in agreement.

Keywords: MHD, Casson fluid, Power-law form of surface concentration and temperature, Stretching sheet.

ASPECTS OF MHD CASSON NANOFLUID FLOW PAST A POROUS VERTICAL PLATE – AN EXACT SOLUTION

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Abstract: The present work is on MHD Casson nanofluid flow past an upright plate under the existence of mass diffusion and chemical reaction. An exact solution has been gained for fluid velocity and temperature from the partial differential equations that govern the flow. The solution in exact form is obtained by applying Laplace transform technique. Graphical representations and numerical table values are taken and analyzed the flow properties under the influence of considered physical parameters. The examination is carried out by comparing the nature of the flow in respect of published literature in the relevant flows.

Keywords: Casson nanofluid, Chemical reaction, Porous plate, Laplace transforms, thermal radiation.

A REVIEW ON LUMINESCENCE PROPERTIES OF DY^{3+}-DOPED PHOSPHORS DERIVED FROM AGRICULTURAL WASTE FOR SOLID STATE LIGHTING APPLICATIONS

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Abstract: The Dy^{3+}-doped di-calcium silicate (Ca_2SiO_4) phosphors have been synthesized from conventional solid state reaction method by utilizing the agricultural waste materials. Agricultural materials as raw chemicals of SiO_2 and CaO from rice husk and egg shell powders are consumed in its place of chemicals which were synthesized from non-renewable raw materials. The luminescence characteristics of prepared phosphors were studied through FLS 980 spectrometer measurements. Excitation spectrum of Dy^{3+}-doped di-calcium silicate phosphors exhibited three intense bands at 351, 366 and 387 nm are observed within the near UV and blue regions. Luminescence spectra of Dy^{3+}-doped phosphors exhibits sharp intense characteristic blue and yellow emission peaks due to the transitions of $^4F_{9/2} \rightarrow {}^6H_{15/2}$ and $^4F_{9/2} \rightarrow {}^6H_{13/2}$, respectively. Emission appearances of established phosphors such as CIE co-ordinates, CCT, CP and lifetimes, etc., of Dy^{3+} ion have been measured. The decay rates of Dy^{3+} ion exhibits mono-exponential character for lower concentration and it turns into non-exponential character for higher concentrations attended by shortening of lifetime values for higher concentrations. All the results have been deliberated with reported values and found to be better than many of the reported phosphors derived from agricultural waste materials. Hence, present prepared phosphors might be useful to develop low-cost solid state lightning devices as well as effective consumption of agricultural and food waste materials.

DUAL-PHASE DEPENDENT, STRUCTURAL, OPTICAL BANDGAP AND PHOTOLUMINESCENCE PROPERTIES OF $BAHPO_4/BA_3(PO_4)_2$HIERARCHICAL STRUCTURES BY WET-CHEMICAL METHOD

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Abstract: Ba_3 $(PO_4)_2$ structure with Rhombohedral phase was prepared by a facile wet chemical method. In this experiment, NaOH used as a surfactant to obtain various pH values. The prepared samples were analyzed using several characterized techniques such as XRD, SEM, EDX, UV-visible absorption and photoluminescence spectroscopy. Orthorhombic ($BaHPO_4$) phase was appeared at pH7 and Rhombohedral Ba_3 $(PO_4)_2$ phase at pH13. This shows that the pH value is very important for final product formation and its morphology. Band gap energy of synthesized microstructure was found to be 3.60 eV for rhombohedral phase (pH13) and 4.89 eV for orthorhombic phase (pH7). Significantly, the prepared sample for pH13, an intense blue light emitted a narrow band in the broad band emission spectra, for which have been explained from the transition of $^3T_1 \rightarrow {}^1A_1$ in PO_4^{3-} ions. In the meantime, an apparent red shift was observed while changing the excitation wavelengths.

NUMERICAL STUDY ON THE FLOW OF BUONGIORNO'S NANOFLUID WITH SORET EFFECT IMMERSED IN SQUARE CAVITY

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Abstract: The present investigation is initiated to derive the nature and characteristics of Buongiorno's nanofluid under heat transfer, thermal radiation and thermal diffusion immersed in square cavity. The governing partial differential equations are solved numerically by finite difference method using MAT lab code and square grids. The results are illustrated through graphs and tables. It is noticed that rate of heat transfer enhances with rising values of Rayleigh number. A comparison has done with the present results and published results and found a good agreement in it.

Key words: Square cavity, Thermal radiation, Buongiorno's Nanofluid, Soret effect and finite difference method.

OPTICAL PROPERTIES OF RE^{3+}-DOPED PHOSPHORS SYNTHESIZED FROM SOLID STATE REACTION METHOD

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Abstract: Now-a-days the luminescent materials are the most important in human life. Where all the phosphor materials are prepared by using various techniques, such that the solid state reaction method is high temperature technique. But in this method, we can get the best optical properties due to that we will choose this method. Synthesized phosphors are characterized through X-ray diffraction (XRD), scanning electron microscopy (SEM) and photoluminescence spectroscopy. The XRD results indicate that crystalline nature/structure of the phosphors. SEM images exhibit the particle shapes and sizes which are agglomerated or not also. The excitation and emission of RE^{3+} ions are depending upon the concentration and the quenching will be occurred. By using emission intensities color co-ordinates (x, y) are evaluated and are found to be located in different region of CIE chromaticity diagram for various RE^{3+} ions. From the above results, it is indicated that the prepared phosphors could be useful for solid state lighting applications.

Keywords: Rice husk ash, Egg shells, Ca_2SiO_4 phosphors, Dy^{3+} ions, Color coordinates.

EXACT SOLUTION OF HYBRID NANOFLUID FLOW PAST A PERMEABLE VERTICAL PLATE IN CONDUCTING FIELD

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Abstract: The characteristics of MHD hybrid nanofluid flow past an upright plate under the existence of mass diffusion and thermal radiation is examined thoroughly. An exact solution has been gained for fluid velocity and temperature from the partial differential equations that govern the flow. The solution in exact form is obtained by applying Laplace transform technique. Graphical representations and numerical table values are taken and analyzed the flow properties under the influence of considered physical parameters. The examination is carried out by comparing the nature of the flow in respect of published literature in the relevant flows.

Keywords: Hybrid nanofluids, Mass diffusion, Porous plate, Laplace transform technique, thermal radiation.

DOUBLE DIFFUSION EFFECTS ON MHD NANO FLUID OVER A STRETCHED SURFACE IN CONDUCTING FIELD

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Abstract. This research investigates the effect of thermal radiation on the MHD stagnation point flow of nano liquid over a stretched surface with varying temperature and concentration. The nonlinear coupled governing equations can be turned into a set of nonlinear ordinary differential equations by employing similarity transformations. The set of nonlinear equations and boundary conditions are computationally solved using the shooting technique. It is shown and discussed in great detail how various flow field parameters affect momentum, heat measurement, diffusion, rate of heat transfer, skin friction coefficient and rate of mass transfer. Futher, the numerical outcomes of this study matched with previously published outcomes and the results were determined to be in agreement.

Keywords: MHD, Nnaofluid, Power-law form of surface concentration and temperature, Stretching sheet.

UV PROTECTING BEHAVIOR OF IMIDAZOLE BASED ZNO HYBRID THIN FILMS FOR SUNSCREEN APPLICATIONS

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Abstract: UV radiations near visible region effects the human, and it causes many skin diseases. UV light not only effects human and also decolors most of the textile fabrics. It degrades anticorrosive coatings and it triggers the corrosion over the metal surface. The protection of UV radiations has lot of attraction in the field of engineering research field to prepare sunscreen coatings. This work explains the preparation and characterization of Poly (N-vinyl imidazole)/ZnO by different techniques. The UV protective behaviors of prepared polymer composite thin films, make them as promising candidates for UV shielding and sunscreen applications.

Keywords: Polymer nanocomposite, Sunscreen applications, Thin films, UV Protective Coating.

EXACT SOLUTION AND FLOW PROPERTIES OF MHD HYBRID NANOFLUID UNDER HEAT SOURCE/SINK

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Abstract: The mechanism of MHD hybrid nanofluid flows past an upright porous plate under the existence of heat source and thermal radiation is examined thoroughly. An exact solution has been gained for fluid velocity and temperature from the partial differential equations that govern the flow. The solution in exact form is obtained by applying Laplace transform technique. Graphical representations and numerical table values are taken and analyzed the flow properties under the influence of considered physical parameters. The examination is carried out by comparing the nature of the flow in respect of hybrid nano fluid and usual nanofluid.

Keywords: Hybrid nanofluids, Porous plate, Laplace transform technique, thermal radiation, heat source.

STUDY ON THE FLOW OF BUONGIORNO'S NANOFLUID WITH THERMAL RADIATION EMBEDDED IN SQUARE CAVITY

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Abstract: The present investigation is initiated to derive the nature and characteristics of Buongiorno's nanofluid under heat transfer, thermal radiation and thermal diffusion immersed in square cavity. The governing partial differential equations are solved numerically by finite difference method using MAT lab code and square grids. The results are illustrated through graphs and tables. It is noticed that rate of heat transfer enhances with rising values of Rayleigh number. A comparison has done with the present results and published results and found a good agreement in it.

Key words: Square cavity, Thermal radiation, Buongiorno's Nanofluid, Soret effect and finite difference method.

FERROMAGNETIC AND PHOTOLUMINESCENCE PROPERTIES OF INDIUM-TIN-OXIDE NANOPARTICLES

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Abstract: Indium-Tin-Oxide nanoparticles were synthesized by solid state reaction method and heated at 600^{O} C temperature in reduced pressure environment. Oxygen vacancies may be created in the sample. XRD studies declared that the particle size of sample is 47nm with the single-phase cubic bixbyite structure. Sn ions were doped into the in_2O_3 lattice, it was observed by the FTIR and Raman spectroscopy. XPS analysis was carried out. In 3d peaks were observed at binding energy of 444.14 and 451.62 eV, which proved In3+ state. Sn 3d peaks were found at 486.15 and 494.58 eV. O 1s peak was observed at 531.67 eV. In_2O_3 and SnO_2 shown the diamagnetic property, Tin doped Indium oxide nanoparticles shown the ferromagnetism at 100K, which could be attributed to itinerary electrons due to oxygen vacancies. Blue and Blue-green emissions were observed in Indium-Tin-Oxide nanoparticles due to oxygen vacancies and surface defects.

Key words: Indium-Tin-Oxide; Solid state reaction; ferromagnetism; Photoluminescence.

NUMERICAL ANALYSIS OF DOUBLE DIFFUSION EFFECTS ON MHD JEFFREY FLUID OVER A STRETCHED SURFACE

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Abstract. This research investigates the effect of thermal radiation on the MHD stagnation point flow of Jeffrey liquid over a stretched surface with varying temperature and concentration. The nonlinear coupled governing equations can be turned into a set of nonlinear ordinary differential equations by employing similarity transformations. The set of nonlinear equations and boundary conditions are computationally solved using the shooting technique. It is shown and discussed in great detail how various flow field parameters affect momentum, heat measurement, diffusion, rate of heat transfer, skin friction coefficient and rate of mass transfer. Futher, the numerical outcomes of this study matched with previously published outcomes and the results were determined to be in agreement.

Keywords: MHD, Jeffrey fluid, Power-law form of surface concentration and temperature, Stretching sheet.

ASPECTS OF MICRO-POLAR FLUID FLOW PAST A POROUS VERTICAL PLATE WITH VISCOUS DISSIPATION

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Abstract: The present work is on Micro-polar fluid flow past an upright plate under the existence of mass diffusion and chemical reaction. An exact solution has been gained for fluid velocity and temperature from the partial differential equations that govern the flow. The solution in exact form is obtained by applying Laplace transform technique. Graphical representations and numerical table values are taken and analyzed the flow properties under the influence of considered physical parameters. The examination is carried out by comparing the nature of the flow in respect of published literature in the relevant flows.

Keywords: Micro-polar fluid, Chemical reaction, Porous plate, Laplace transforms, Viscous Dissipation, thermal radiation.

ASPECTS OF MHD JEFERRY NANOFLUID FLOW PAST A POROUS VERTICAL PLATE UNDER SORET EFFECT

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Abstract: The present work is on MHD Jeferry nanofluid flow past an upright plate under the existence of mass diffusion and chemical reaction. An exact solution has been gained for fluid velocity and temperature from the partial differential equations that govern the flow. The solution in exact form is obtained by applying Laplace transform technique. Graphical representations and numerical table values are taken and analyzed the flow properties under the influence of considered physical parameters. The examination is carried out by comparing the nature of the flow in respect of published literature in the relevant flows.

Keywords: Jeferry nanofluid, Chemical reaction, Porous plate, Laplace transforms, thermal radiation.

HALL CURRENT AND SORET EFFECTS ON MHD CONVECTIVE FLOW PAST AN INCLINED POROUS PLATE

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ABSTRACT: In this paper an attempt is made to study the chemical reaction and combined buoyancy effects of thermal and mass diffusion on MHD convective flow along an infinite vertical porous plate in the presence of Hall current with variable suction and Soret effect. A uniform magnetic field is applied in a direction normal to the porous plate. The equations governing the fluid flow are solved using the perturbation technique and the expressions for the velocity, the temperature and the concentration distributions have been obtained. Dimensionless velocity, temperature and concentration profiles are displayed graphically for different values of the parameters entering into the problem have been investigated. It has been observed that an increase in the Soret parameter leads to an increase in the primary and secondary velocities, and also an increase in the concentration. The primary and secondary velocities decrease with increase in the chemical reaction parameter and magnetic field parameter.

Keywords: Hall Effect, Porous medium, chemical reaction, Heat generation/absorption, Soret effect.

NANO PARTICLES OF BINIO3 FOR APPLICATIONS IN NEGATIVE THERMAL EXPANSION

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Abstract: Computers, smart phones, and other electronics are made up of numerous tiny bits and components that are resistant to breaking and damage caused on by overheating. Therefore, there is a demand need to create machine parts that can withstand damage and size and length changes were brought on by heat. It is a frequent misunderstanding that materials expand when heated and shrink when cooled. In truth, certain materials respond in the opposite manner, expanding when heated and contracting when cooled, a peculiar phenomena known as negative thermal expansion (NTE). Thus, NTE materials have attracted research's attention. Because it would be possible to create materials that are even less heat-sensitive than currently available ones by taking advantage of their properties and combining them with non-NTE materials. Unfortunately, it is difficult to fully understand the mechanisms underlying NTE. In the current study, nano-BiNiO3 particles are made using the co-precipitation process and are then calcined at various temperatures. By using X-ray diffraction analysis (XRD), field emission scanning electron microscopy (FESEM), and energy dispersive X-ray spectroscopy, the produced BiNiO3 nanoparticles were studied (EDX). BiNiO3 cubic phase formation for the prepared sample at $800^{O}C$ was discovered by XRD examination. The BiNiO3 nanoparticles were pure and had a wide size distribution, according to SEM/EDX mapping.

Keywords: precipitation method, Phase transition , BiNiO3 nano particles.

ANALYSIS OF ENERGY AND MASS TRANSPORT IN FREE CONVECTION FLOW OF WATER BASED NANOFLUID OVER AN INFINITE POROUS PLATE

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Abstract: In the current investigation paper the effects of thermal radiation, radiation absorption, Diffusion thermo and chemical reaction on the analysis of energy and mass transport in free convection flow of water based Nanofluid over an infinite porous plate. The plate is moved with a constant velocity U_0, temperature and the concentration are assumed to be fluctuating with time harmonically from a constant mean at the plate. The non-dimensionalized governing differential equations by the appropriate frontier conditions are resolved by the perturbations technique. The impacts of the physical constants on the flow as well as the heat transfer features are displayed graphically and analyzed for nanoparticles are Cu, $Al_2 O_3$ and TiO_2. For the engineering industry, the skin friction coefficient examined numerically in detail. This enhancement is very significant for copper nanoparticles. This is due to the high conductivity of the solid particles of Cu, $Al_2 O_3$ than those of TiO_2. Also it is noticed that the solutal boundary layer thickness decreases with an increase in chemical reaction parameter. It is because chemical molecular diffusivity reduces for higher values of Kr.

MHD HEAT AND MASS TRANSFER STEADY FLOW OF A CONVECTIVE FLUID THROUGH A POROUS PLATE IN THE PRESENCE OF MULTIPLE PARAMETERS

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Abstract: Thermo diffusion, heat source/sink, Joule and chemical effects on heat transfer in MHD mixed convection flow and mass transfer past an infinite vertical plate with Ohmic heating and viscous dissipation have been studied. Approximate solutions have been derived for velocity, temperature, concentration profiles, skin friction, rate of heat transfer and rate of mass transfer using perturbation technique. The obtained results are discussed with the help of graphs to observe the effect of various parameters like Grashof number (Gr), the modified Grashof number (Gm), magnetic parameter (M), Permeability parameter(K), Prandtl number (Pr), Heat Sink(Q), Radiation Parameter (F), Soret parameter (S_0), Eckert number (E),Schmidt number(Sc) and Chemical reaction parameter(K_0) taking two cases viz. Fluid velocity, temperature and concentration profiles are comparison with Pr=0.71(Air) and Pr =7 (Water) various parameters in cooled and heated plates. Case I: when Gr > 0 (flow on cooled plate), and Case II: Gr < 0, (flow on heated plate). Both the fluid velocity and concentration rising with the increment values of Soret parameter in the fluids Air and Water and also discussed skin friction, Nusselt number and Sherwood number in the fluids mercury, electrolytic solution, air and water.

Keywords: MHD, thermo- diffusion, porous medium, heat source/sink and Joule effect.

RADIATION ABSORPTION EFFECT ON CONVECTIVE FLOW OF A NEWTONIAN FLUID PAST AN INCLINED PLATE IN CONDUCTING FIELD

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Abstract: Radiation absorption effect on the unsteady magneto-hydrodynamic mixed convection flow over an inclined permeable moving plate with the presence of thermal radiation, heat absorption and homogenous chemical reaction, subjected to variable suction is investigated. The problem is formulated in terms of non-similar equations. The equations governing the flow are transformed into a system of nonlinear ordinary differential equations by using perturbation technique. The expressions for velocity, temperature and concentration are obtained. Also the expressions for physical quantities such as skin friction, Nusselt number and Sherwood number are derived. The effects of all the parameters involved in the problem are reported with the help of graphs and tables. The problem is limited to slow velocity flow of chemically reacting fluids in porous media. Future research may consider inertia effects of porous media for relatively higher velocity flows. A very useful source of information for researchers on the subject of radiation absorption effects in porous media.

Keywords: Radiation absorption, MHD, Radiation, Heat absorption,Chemical reaction, Porous medium, mixed convection, inclined plate.

$BiNiO_3$ NANOPARTICLES FOR NEGATIVE THERMAL EXPANSION (NTE) APPLICATIONS

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Abstract: Computers, smart phones, and other electronics are made up of numerous tiny bits and components that are resistant to breaking and damage caused on by overheating. Therefore, there is a demand need to create machine parts that can withstand damage and size and length changes were brought on by heat. It is a frequent misunderstanding that materials expand when heated and shrink when cooled. In truth, certain materials respond in the opposite manner, expanding when heated and contracting when cooled, a peculiar phenomena known as negative thermal expansion (NTE). Thus, NTE materials have attracted research's attention. Because it would be possible to create materials that are even less heat-sensitive than currently available ones by taking advantage of their properties and combining them with non-NTE materials. Unfortunately, it is difficult to fully understand the mechanisms underlying NTE. In the current study, nano-BiNiO3 particles are made using the co-precipitation process and are then calcined at various temperatures. By using X-ray diffraction analysis (XRD), field emission scanning electron microscopy (FESEM), and energy dispersive X-ray spectroscopy, the produced BiNiO3 nanoparticles were studied (EDX). BiNiO3 cubic phase formation for the prepared sample at $800^{O}C$ was discovered by XRD examination. The BiNiO3 nanoparticles were pure and had a wide size distribution, according to SEM/EDX mapping.

KEYWORDS: precipitation method, Phase transition , BiNiO3 nano particles.

COMPARISON OF ALGORITHM BASED EFFICIENTDOMINATION NUMBER WITH TOTAL DOMINATION NUMBER

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ABSTRACT:

Many researchers have worked on the concept of domination from 1960 to till date. Especially, extensive research work has been done on domination parameters in the last three decades and more than 2000 papers are published so far. As a result of significant research in the field of intersection graphs like interval graph and circular-arc graph, more researchers started working on domination parameters. Subsequently, so many articles have been published on different domination parameters using interval and circular- arc graphs. In this paper, another intersection graph i.e., Trapezoidal graph (TG) issued to study some domination parameters. Efficient domination was introduced by Bange [5][6] et al. Once they constructively characterized trees with disjoint dominating sets of many varieties. Danie Liang et.al [20] investigated permutation graphs and trapezoidal graphs and found more efficient algorithms. Based on these algorithms, this work proposes another algorithm to find efficient domination number, Total domination number of TG and comparing the numbers.

Keywords: Domination, Trapezoidal graph, Efficient domination number, Total domination number.

EFFECT OF Pr^{3+} IONS ON SPECTROSCOPIC AND OPTICAL PROPERTIES OF BISMUTH BOROLITHIUM GLASSES

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Abstract: Ytterbium incorporated Bi_2O_3–B_2O_3–Li_2O–BaO-Pr_2O_3glasses have been found to be suitable for various photonics applications. In the current article, ytterbium (0.5, 1, 1.5, 2.0 and 2.5 mol%) were assorted with Bi_2O_3–B_2O_3–Li_2O–BaO-Pr_2O_3glass network formed by the conventional melt-quenching process. The XRD, SEM, Optical absorption and FTIR studies employed to explore the detailed optical and structural features of the current glass samples. The analysis of XRD and SEM results confirmed the amorphous nature and their local structural changes perceived by DTA and FTIR results. From absorption data, indirect band gap energies, UE and cut of wavelength values are calculated. It is noticed that the optical properties improved with the increasing ytterbium compositional concentrations up to the level 2.5 mol%. The calculated optical and spectroscopy studies confirmed quality of the light generated from the as-systemized glasses for LASER production. The obtained experimental results supported the usefulness of the developed glasses in the field of photonics.

Keywords: BiBLPYb glasses; Ytterbium; FT-IR, DTA; Opticalspectra.

COMPARISON OF ENGINEERING PROPERTIES OF SOILS THROUGH NORMATIVE MINERAL ANALYSIS

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Abstract: The mineralogical composition of a rock determines the fundamental physical properties of a rock mass. Similarly, the fundamental properties of a soil mass are dependent on the properties of the parent rock(s). Soil is comprised of minerals; these minerals are the product of weathering of the rocks. Every where on the land surface there is rock formation. By understanding the effect that the mineral composition has on the geotechnical properties, it is possible for a civil engineer to estimate the geotechnical properties of a soil from the normative mineral analysis which gives the percentage of mineral composition. The normative mineral analysis is the micro level study that deals with the determination of chemical composition of soil samples and the bond formation, the surface texture and, the mineral structure and geometry of the element by Energy Dispersion Analysis of X-rays (EDAX) and Scanning Electron Microscope (SEM) respectively..In this research work, the authors have conducted the tests (both macro level and micro level investigations) on four different soils and compared the both normative and engineering properties of the soils. It is concluded by comparing the micro levels results with that of results obtained from the experimentally conducted index and engineering properties. The inferences from the studies are that the Albite mineral percentage content is directly proportional to plasticity index of soils; the percentage content of hypersthene mineral is indirectly proportional to plasticity index of soils. It is also concluded from this research work that the percentage of clay minerals increases the strength of soil.

Keywords: Rock formation, Mineral composition, Geotechnical properties, Normative mineral analysis, CIPW norm calculations.

SYNTHESIS OF 10-AMINO-2,3,11-TRIMETHOXY- 6,7-BIS (METHOXY METHYL) 6-HYDROXY- DIBENZOCYCLOOCTADIENE FROM GMELINOL HYDROGENOLYSIS PRODUCT.

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Abstract: Dimethyl ether derived from gmelinol hydrogenolysis product reacts with TTFA (thallium tris-trifluoro acetate) in TFA (trifluoro acetic acid) to produce Dibenzocylooctadiene,spirodienone and a aryl tetralin. Dibenzocyloocatadiene, on further oxidation with DDQ (dichloro dicyano benzoquinone) gives oxygen bridged-dibenzocyclooctadienone. Reduction of oxime, prepared from octadienone, yields amino-dibenzocyclooctadiene, which is a nitrogen substituted lignan not reported sofar.

Key words: Lignans, spiro compounds.

SYNTHESIS AND CHARACTERIZATION OF ZrO_2 NANOCOMPOSITES

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Abstract: N- Vinyl carbazole is used as a monomer in the production of Poly(N-Vinyl carbazole It is used is photoreceptors, NVC is a saturated hydrocarbon with a helical structure due to aromatic carbazole. Pendant group is a thermoplastic of conjugated polymer with high thermal and chemical stability. It has high refractive index. These characteristics are useful to electroluminescent devices and photorefractive material. Poly(NVC) is also used as hole transparent layer in organic light emitting diodes. N-Vinyl carbazole have good corrosion inhibiting character due to the presence of heterocyclic rings. N-Vinyl carbazole, have good thermal stability, high dielectric constant and exhibit photo conductivity. It seems reasonable, therefore to modify the thermal properties of methacrylate by preparing copolymers with N-Vinyl carbazole. The growing interests in these organic polymers are due to their characteristics, which provide the end products with enhanced properties as compared to materials and wider applications drive efforts to prepare materials with highly improved properties.

Keywords: Poly(N-Vinyl carbazole, ZrO_2nanocomposites, Pendant group, light emitting diodes.

ENHANCEMENT OF THE LIQUID CRYSTALLINE P-N OCTYLOXY BENZOIC ACID'S BIREFRINGENCE AND ORIENTATIONAL ORDER PARAMETER WITH SCATTERED ZNO NANOPARTICLES

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Abstract: ZnO nanoparticles (nps) are used in many electro-optical applications due to their special characteristic properties. Nanoparticles are improves the optical parameters of molecules of the soft liquid crystalline (LC) materials. This paper mainly focuses on the optical properties of LC materials of p-n-octyyloxy benzoic acid (8oba) compound homogeneously dispersed ZnO nps at lower weight concentrations i.e., 1, 1.5, 2 and 2.5wt%. SEM is used for the determination of the presence ofZnO nps dispersed in LC compounds. POM and DSC are used for the determination of the phase transition temperatures of these compounds. It is found that the phase transition temperatures are decreased with increasing weight concentrations of ZnO nps. For the determination of the refractive indices at various wavelengths (460, 500, 570 and 635 nm)a wedge shaped modified spectrometer is used for this purpose. The methods like Vuks, Kuczynski, Effective geometryare used to estimate the orientational order parameter S of 8oba molecules with dispersed ZnO nps of different concentrations. The values of birefringence (δn) and order parameter (S) are enhanced for the molecules of 8oba with the dispersion of increasing concentrations of ZnO nps in the stabilized nematic thermal region, which will be used to enhance the LC display properties.

Keywords: 8oba compound, ZnO nanoparticles,SEM, POM, DSC, birefringence, order parameter

NANO-ZNO COATING ANALYSIS OF CATALYTIC CONVERTER EMISSION CHARACTERISTICS

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Abstract: Protection of the environment from pollutants has drawn attention due to the ever-growing problem of pollutants emitted by cars. Due to the easy refuelling and cheap maintenance requirements of gasoline-powered vehicles, many people have chosen to drive them despite the growing environmental danger that the increased volume of traffic on our country's roads currently poses. Although many specialists have employed several tactics to reduce the quantity of emissions produced by automobiles, there is still much potential for improvement in this field. This research compares the emission characteristics of a four-stroke gasoline engine with and without a catalytic converter that is enclosed in nano zinc oxide (nano ZnO). According to the results, the catalytic converter with nano-ZnO coating helped to cut CO, CO2, HC, and NO emissions by 41.3%, 71.4%, 48.2%, and 46.7%, respectively.

Keywords:nano-ZnO; catalytic converter; engine emissions; gasoline engine; nano-coating.

HEAT ENERGY PERFORMANCE FOR RADIATED WALL JET STREAM OF MAGNETIC HYBRID NANOFLUID UNDER STRONG SUCTION

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Abstract: The traditional Merkin and Needham wall-jet issue was investigated for a copper-titanium dioxide incorporating magnetic field and heat production or heat absorption implications. Further, suction/injection and radiation effects are also considered. Employing correspondent alterations, the central equations modified as nonlinear ordinary differential equations which resolved quantitatively in favor of the hybrid nanofluid circulation and heat allocation that use the shooting approach. Consequently, we discover equations for the decreased layer resistance coefficient along with lower Nusselt number. The analysis presented that velocity of fluid enhances with increment in moving stricture, while it can be lowered via higher estimation of velocity slip stricture. Layer resistance coefficient is lowered via velocity slip factor, whereas it increased for Cu-nanoparticle volume fraction. When there is a magnetic polarity and heat flux present, nanofluid transfer's heat more slowly than hybrid nanofluid.

IMPACT OF CHROMIUM IONS ON SPECTROSCOPIC AND DIELECTRIC PROPERTIES OF BI_2O_3-B_2O_3-AL_2O_3-MGO DOPED GLASSES

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Abstract: Bismuth borate glasses doped with Cr_2O_3 is prepared by melt quenching technique with the chemical composition $20Bi_2O_3+65B_2O_3+10Al_2O_3+(5-x)MgO+xCr_2O_3$(where x=0,0.1,0.2,0.3,0.4,0.5 mol%).These prepared glasses were characterised by various spectroscopic techniques such as XRD,Optical Absorption,FTIR,Raman,EPR,Emission and dielectric studies.The amorphous nature of the glass has been confirmed from its XRD profile. Optical absorption spectrum shows the absorption bands in visible region which are the characteristics of Cr^{3+} ions in octahedral symmetry.FTIR and Raman analysis were carried out to examine the impact on the structure of bismuth borate glasses.In EPR spectra, resonance signals at g=4.9 and g=1.9 were observed.These resonance signals are attributed to isolated Cr^{3+} ions and exchange coupled Cr^{3+} pairs respectively. The optical absorption and EPR spectra recorded at room temperature have indicated that there is a gradual increase in the presence of octahedral chromium ions with increase of Cr_2O_3 concentration in the glass network.The luminescence spectra exhibited near infrared emission bands at 739nm and 761nm under 420nm excitation wavelengths.These glasses were analysed by the dielectric characteristics like dielectric constant ε', dielectric loss tanδ and a.c. conductivity σ_{ac}. The maximum conductivity of glass sample C5 was due to dominant present of Cr^{3+} ions.It is perceived that the semiconducting nature of glass sample C5 was the highest among all the prepared glasses.

Keywords: X-ray diffraction; Infrared spectroscopy; Optical properties; Emission spectra; Dielectric properties.

APPLYING FIXED POINT METHODS IN MATHEMATICAL MODELING

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Abstract: We examine generalized algebraic metric spaces and perform fixed-point computations. The existence and unique solutions of the novel coronavirus 2019-nCoV/SARS-CoV-2 model are then investigated via fractional derivatives. We employ a complex algorithmic method to improve this scientific work to solve the coronavirus 2019-nCoV/SARS-CoV-2 model.

SILVER NANOPARTICLES EFFECTS AND APPLICATIONS IN VARIOUS FIELDS

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Abstract: The most significant nanoparticles utilised in food and other industries are silver nanoparticles. In the future, silver nanoparticles might be used to treat numerous illnesses. They can coordinate a very high number of ligands due to their exceptionally huge surface area. Silver nanoparticles (AgNps) are silver particles with sizes ranging from 150 to 200 nanometers. Due to their distinctive qualities and extensive potential for use in a variety of industries, including electronics, cosmetics, and medicine, silver nanoparticles are gaining a lot of interest.AgNp is mostly synthesised via chemical and physical processes, although these methods are expensive and can absorb harmful chemicals. In this review, we emphasise the more practical and cost-effective biological production of AgNps using extracts from fungus, bacteria, and plants. A few recent medical applications are discussed, including anti-inflammatory effects, cancer treatment, and antibacterial action mechanism. We also talked about AgNps' toxicity and how it affects the ecosystem and people's health.

Keywords: Synthesis, Silver nanoparticle,toxicity, antibacterial

BIOMASS AS RENEWABLE ENERGY

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Abstract: The conversion to biomass energy has played a key role in reducing our dependence on fossil fuels. This paper discusses biomass as a renewable energy source. It defines the resources as well as the ways biomass energy is converted into electricity, technologies involved in extracting power from biomass as well as the advantages and the disadvantages of using of biomass as a source of energy. Biomass is cheap and more efficient energy not in India but also in world. It provides energy with simpler manner. It removes the burden on the head of farmer and provides the better opportunity of them. The process of extraction these type energy have studies at starting. Mostly it can be extraction from the wastes. So it is more economically. Biomass systems can be used for village-power applications in the range of 10-250 kW scale. The emerging technologies of biomass as a renewable source of energy is highly advantageous to promote a greener planet and also cut down on the need for fossil fuels which not only cause pollution in the atmosphere but also are fast depleting. It also reviews in this paper a few biomass projects in the India and some other parts of world and discusses the future of biomass.

Keywords: Biomass energy, fossil fuels, electricity, renewable.

.MICROSTRUCTURAL AND ELECTROCHEMICAL PROPERTIES OF Mn_3O_4 NANOPARTICALS BY HYDROTHERMAL SYNTHESIS

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Abstract: Electrical energy is the backbone of work in any device or equipment or appliances or transport system electric vehicles.Supercapacitors (SCs) are occupying majorly portions in this field due to high power density, performance, and long lifetime.This review paper gives latest trends in SCs highlightingtheir materials, electrical energy storage characteristics and their applications in different fields. It also focuses on SC classification, storage mechanisms, modelling and analysis. Different storage mechanisms like double layer, pseudocapacitance,faradic types and also their combinations. Each one is having its own advantages and disadvantages. covers recent research aspects and applications of SCs, highlighting the relationship between material properties and electrical characteristics. Cyclability of storage performance is also reported. On the application, reports are gathered from the present-day applications and for the future challenging fields or situations, where there is scope for their applications is also predicted.

Key words: •Supercapacitors• Double layer •Pseudocapacitance• Faradic storage

CALCIUM ZIRCONIUM SILICATE PHOSPHORS DOPED WITH Tb^{3+} IONS FOR NOVEL GREEN EMISSION

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Abstract: Trivalent terbium ions (Tb^{3+})-doped calcium zirconium silicate ($Ca_3ZrSi_2O_9$) phosphors ($Ca_3ZrSi_2O_9:xTb^{3+}$), with molar compositions $0.005 \leq x \leq 0.13$, were effectively produced by the standard sol-gel method. The synthesized samples were characterized by X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Fourier Transform-Infrared (FT-IR) Spectroscopy, photoluminescence (PL) excitation and PL emission. XRD spectral profiles of the prepared samples demonstrate the formation of a high purity, single phase, monoclinic structure. SEM micrographs of the $Ca_3ZrSi_2O_9:xTb^{3+}$ phosphor samples show chunky solids interlocked in a tiles-like pattern. The FT-IR spectra reveal the structure and bond activities of the samples. The PL excitation spectra demonstrate the $4f^8 \rightarrow 4f^75d^1$ transitions of Tb^{3+} ions under 545 nm emission wavelength. The PL emission spectra of Tb^{3+}ions recorded under 243 nm excitation wavelength exhibit $^5D_3 \rightarrow {}^7F_J$ (J = 6, 5, 4) and $^5D_4 \rightarrow {}^7F_J$ (J = 6, 5, 4, 3) transitions over the wavelength range of 350-650 nm. Of all these emission transitions, the one pertaining to the $^5D_4 \rightarrow {}^7F_5$ transition around 545 nm is strong and attributed to green color emission. The photometric analysis also confirms the intense green color emission from the $Ca_3ZrSi_2O_9:0.09Tb^{3+}$ phosphor, which further supports its potential application in the fabrication of UV-excited w-LEDs.

Keywords : $Ca_3ZrSi_2O_9$; Tb^{3+} ions; Sol-Gel; Photoluminescence

BIODEGRADABLE POLYOL BASED ENVIRONMENTAL FRIENDLY POLYURETHANE/NANOCLAY NANO-COMPOSITES FORFOOTWEAR APPLICATION: OPTIMIZATION AND CHARACTERIZATION

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ABSTRACT: Biodegradable polyol,polycaprolactone diol (PCL) has been chosen as major component (~ 77 %) to develop polyurethane (PU) foam with promising physicochemical and mechanical properties upon optimization with industrial catalyst and isocyanate system as well as variation of isocyanate index in presence of nanoclay by using an injection molding machine. Accordingly, a series of cup test has been executed to optimize the parameters like cream time, pinch time tack free time and indention. Finally, the optimized composition has been moulded with 0-2% variation of clay. Physicochemical characterization such as density, hardness, abrasion and flexibilityof these injection molded biodegradable PU-Nanoclay composites were studied and correlated against the morphological, thermal and chemical characteristics of each foam sample, particularly to identify the suitable one, which exhibits the recommended physical properties for application as footwear materials.

Keywords: injection molded PU, biodegradable, poly-caprolactone diol, LDH

DATA SCIENCE APPLICATIONS AND IMPORTANCE OF STATISTICS AND MATHEMATICS IN DATA SCIENCE

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Abstract: Data science is one among the leading and most popular technologies in the world today. The goal of data science is to discover meaningful insights from massive datasets and derive the possible solutions to resolve business issues. Data science is not only focuses on finding the solution but also predicts the future with past patterns or insights. Statistical and mathematical fundamentals will allow thinking critically and being creative when using the data to solve business problems and make data driven decisions. Statistics provides tools and methods to find structures and give deeper data insights. In the present paper various applications in data science and how the mathematics and statistics will be important to design and solve the problems are presented.

MICRO-STRUCTURAL, ELECTRICAL AND ELECTROCHEMICAL PROPERTIES OF $LI_4T_5O_{12}$ ANODE MATERIAL FOR LITHIUM-ION BATTERIES

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Abstract: Lithium titanate ($Li_4T_5O_{12}$, LTO) has been suggested as a new anode material for lithium ion batteries because of its stable operating voltage 1.55V. The structural, electrical and electrochemical measurements of the anode material prepared by conventional solid state reaction method is determined from TG/DSC, XRD, FTIR, FESEM with EDX, CIS and charge/discharge studies. The structure of the material belonging to cubic spinel group with Fd-3m space group with no traces of impurities as revealed from the pattern of X-ray diffraction. The morphological features of the phase and distribution of the size of the particles are in the range of 0.9 to 1 μm as reflected from scanning electron microscopy (SEM). The FTIR spectra built of TiO_6 octahedra and LiO_6 tetrahedra are confirmed the spinel structure. The impedance, dielectric and dielectric loss (tanδ) studies are carried out to analyse the variations of different parameters with frequency for different temperatures to have the adequate information about the conduction mechanisms. The impedance study reveals the good conductivity is found to be 1.27×10^{-5} S/cm at room temperature at a frequency ranging from 50 Hz to 1 MHz. The cyclic voltammetry curves indicate that the electrochemical reaction is completely reversible. The first cycle charge and discharge capacity values are 140.7467 and 134.5067 $mAh.g^{-1}$ with capacity retention of 90% after the 3 cycles.

Keywords: Spinel Lithium Titanate, XRD, FESEM, LCR, conductivity, charge/discharge studies

STUDY THE CHARACTERISTIC FEATURES OF Dy^{3+}:Sm^{3+} IONS IN Li_2O-CaF_2-Al_2O_3-SiO_2-B_2O_3 GLASSES

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Theme: Materials Science and Engineering (MSE)

Abstract: The current investigation looks at the glass framework Li_2O-CaF_2-Al_2O_3-SiO_2-B_2O_3 having Dy^{3+}:Sm^{3+} ions arranged by melt and quenching method and its characterization consist of XRD, FTIR, optical and emission studies. By utilizing J-O theory; oscillator strength, JO parameter, radiative transition probability, and branching ratios measured to find the potentiality of the materials. Based on the emission the maximum intensity occurs at $^4G_{5/2} \rightarrow {}^6H_{7/2}$ transition specifying that the glasses are helpful for laser applications.

Keywords: Glasses; JO parameter; branching ratios; laser applications

MICROSTRUCTURE AND ELECTROCHEMICAL ENERGY STORAGE OF Mn_3O_4 NANOPARTICALS BY HYDROTHERMAL SYNTHESIS

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Abstract: Electrical energy is utilized for all appliances and devices. This makes it to store it as much as possible. It can be made available in batteries and supercapacitors now a days. Electrodes for supercapacitors are made with **Mn_3O_4**Hausmannite nanoparticles. They were synthesized by hydrothermal method at low temperatures. Microstructural and electrochemical properties of the prepared Mn_3O_4 nanoparticles were studied. XRD data showed tetragonal structure with I41/amd(141) space group at a crystallite size of 80nm. Formation of Mn_3O_4 nanoparticles were confirmed by Raman vibrational measurements. They also conformed Mn-O bonding. Electrochemical properties of the prepared Mn_3O_4 nanoparticles exhibited a specific capacitance of $204Fg^{-1}$ in 1M Li_2SO_4 aqueous electrolyte at a current density of $1mAcm^{-2}$. The electrode made from the slurry of Mn_3O_4 nanoparticles showed a retaining capacitance of 72% to that of initial value even after 1000 cycles. From these studies we can satisfactorily tell that these tetragonal Mn3O4 hausmannite nanoparticles can be used for making electrodes in supercapacitor.

Keywords: Hydrothermal synthesis • Mn_3O_4 nanoparticles • Microstructural properties • Electrochemical properties •

NEW VALIDATED STABILITY INDICATING AND SIMULTANEOUS ESTIMATION OF CO-ENCAPSULATED CURCUMIN, EPIGALLOCATECHIN GALLATE NANOFORMULATION BY REVERSE PHASE HIGH PERFORMANCE LIQUID CHROMATOGRAPHY METHOD

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Ab**stract:**

Objective: A new reverse-phase high-performance liquid chromatography (RP-HPLC) method was developed to simultaneously determine curcumin and epigallocatechin gallate (EGCG) in novel nanoformulation.

Methods: The high-performance liquid chromatography (HPLC) method was achieved by using a Thermo Scientific Hypersil Base Deactivated Silica (BDS) C18 column (25 cm X 4.6 mm, 5 µm) at 35 °C column oven temperature. The chromatographic procedure was performed with a mobile phase of acetonitrile and 0.025 M (pH 4.0) potassium dihydrogen phosphate (KH_2PO_4) buffer by gradient mode of elution. The injection volume was 20 µl, and the flow rate was 1.5 ml/min, with ultraviolet (UV) detection using a diode array detector (DAD) at a 268 nm isosbestic wavelength.

Results: Drug entrapment efficiency studies were performed with co-encapsulated EGCG and curcumin nanoformulation, which were found to be 94.35 % and 95.12 %, respectively. This shows that the developed method is highly effective. EGCG and curcumin were eluted at 3.9 min and 10.7 min, respectively. The linearity range was 25-175 µg/ml for EGCG and 12.5-100 µg/ml for curcumin. The correlation coefficient was 0.991 for EGCG and 0.999 for curcumin from the linearity curve, which indicates that the method can produce good sensitivity. Forced degradation studies were conducted in acidic, basic, oxidative, thermal, photolytic, and UV stress conditions, where all the degradation peaks were monitored.

Conclusion: The developed method was linear, simple, rapid, robust, and precise. It could be used to quantify EGCG and curcumin simultaneously in various nanoformulations for *in vivo* and *in vitro* applications.

SELECTIVE HYDROGENATION OF CYCLOHEXENONE TO CYCLOHEXANONE OVER HEXAGONAL AND CUBIC MESOPOROUS SILICA SUPPORTED PALLADIUM CATALYSTS

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Abstract: Mesoporous materials exhibit huge applications in various catalytic systems because high surface area, chemical inertness, and well-controlled pore architectures. Both SBA-15 and KIT-6 are mesoporous silica materials, SBA-15 possesses hexagonal pores with *P6mm*plane group, while the KIT-6 has a 3D cubic inter connected pore arrangement with*Ia3d* symmetry. These two mesoporous supported Pd catalysts are used for cyclohexenonehydrogenation to cyclohexanone. Cyclohexanone is usefulintermediate in the synthesis of adipic acidand caprolactam which are used in the food, medicine, fibres and plastic industries (e.g. nylon-6 and nylon-66). In this contribution, we report for the application of mesoporous supports for Pd catalysts towards hydrogenation of cyclohexenone to cyclohexanone.Mesoporous silica supports (MS=SBA-15 and KIT-6) were synthesized using P123 as a template and TEOS as silica source under hydrothermal conditions. Subsequently,MS supported Pdcatalysts were prepared by wet impregnation method. These catalysts are characterized by XRD, N_2 adsorption, SEM, TEM, TPR etc. Catalytic tests were carried out in a fixed bed glass reactor in the temperature range from 160-220 °C. Products analysis was made by off-line GCThe LXRDrevealed the formation of mesoporous structure, while WXRD showed the presence of crystalline metallic Pd species. All the N_2 adsorption-desorption isotherms are found to be of Type IV in nature with H_1 hysteresis loop corresponding to mesoporous structure. The conversion of cyclohexenone is observed to increase upto96 % with 5wt% Pd and then decreased to 85% with further rise in Pd content. However, the selectivity of cyclohexanone is varied over a small range (96-98%) irrespective of Pd loading. It is evident from Fig. 1that the temperature has an adverse effect on the conversion of cyclohexenone (decreased from>95 to 85%) while negligible effect on the selectivity of cyclohexanone (~96-98%). Mesoporous silica supports and Pd loadings are shown clear influence on the catalytic performance. Among all, 5wt% Pd/KIT-6 catalyst show better catalytic activity due to its high surfacearea,interconnectivity in pores and high dispersion of Pd species.

Keywords: Cyclohexanone, Cyclohexanone, Mesoporous silica,SBA-15,SBA-16

CATALYTIC CONVERSION OF PHENOL TO CYCLOHEXANONE OVER PD/KIT-6 CATALYSTS

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Abstract: Mesoporous silica materials have been used extensive research in various fields such as adsorption, catalysis, due to their high surface area, high thermal stability, uniform tuneable pore size etc.Among them, KIT-6 is one of the good example with three dimensional cubic mesoporous materials which has large inter connected poresand high surface area.KIT-6 is used as a catalyst support for various catalytic reactions.Cyclohexanoneis a usefulintermediate in the synthesis of adipic acidand caprolactam which are used in thefood, medicine, fibres and plastic industries(e.g.nylon-6 and nylon-66). In this contribution, wereport for the first time, the application of KIT-6 as a novel support for Pdcatalyststowardshydrogenation of phenol to cyclohexanone.KIT-6 was synthesized using P123 as a template and TEOS as silica source under hydrothermal conditions. Subsequently various loadings of Pd wasimpregnated onto KIT-6 support by wet impregnation method.The contents of Pd are varied in the range (5-9wt %). These catalysts are characterized by XRD, N_2adsorption, SEM, TEM, TPR etc. Catalytic tests were carried out in a fixed bed glass reactor in the temperature range 160-220 °C. Product analysis was made by off-line GC.The LXRD reveals bi-continuous cubic symmetry of KIT-6, WXRD (2θ=10 to 80°) showed the presence of crystalline metallic Pd species. All the N_2 adsorption-desorption isotherms are found to be of Type IV in nature with H_1 hysteresis loop corresponding to mesoporous structure [2]. The conversion of phenolis observed to increase from 70 to 95% with increase inPd loading up to 7 wt% Pdand then decreased to ca. 80% with further rise inPd content.However, the selectivity of cyclohexanone (S-CH-one) is varied over a small range (95-98%) irrespective of Pd content. It is evident from the Fig. 1 that the temperature has an adverse effect on the conversion of Phenol (decreased from >95 to 53%) while negligible effect on the selectivity of CH-one (~95-98%). From LXRD retention ofcatalyst mesoporosity evenafter impregnation ofPd metal is noticed. Particle size was calculated for fresh (13 nm) and spent catalysts (18 nm) from TEM analysis.Pd loading has shown clear influence on the catalytic performance. Among all, 7wt% Pd/KIT-6 exhibited enhanced catalyticactivity due to its high surface area andhigh dispersion of Pd species.

Keywords: Phenol, Cyclohexanone, mesoporous materials, Catalysts

NANO-ZNO COATING ANALYSIS OF CATALYTIC CONVERTER EMISSION CHARACTERISTICS

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Abstract: Numerous non-biodegradable plastics used for both food and non-food purposes have evolved into volatile resources similar to gasoline. Research has steadily advanced to the creation of biodegradable food groups made with biopolymer-based materials by observing oil-phobic choices and revealing insight into the specifics of reducing the effects of nature. By combining common biopolymers like starch and chitosan into biodegradable polymers, nano fillers like MMT (montmorillonite) can change bio-Nano composites. A food item that contains an antibacterial blend prevents bacteria from reproducing on various surfaces and lengthens the period of time that the item is actually easy to use. The best thing about antibacterial bio-Nano composites is that they're recommended to be useful in the food storage industry.

Keywords: Nano compounds, bio-Nano composites, biopolymers, and chitosan are not biodegradable.

ASCENDANCY OF CR_2O_3 ON MORPHOLOGY, SPECTROSCOPIC AND DIELECTRIC PROPERTIES OF GEO_2-LI_2O-P_2O_5-MGO GLASSES

Yusub

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Abstract: The physical, optical and dielectric characteristics of $5GeO_2$-$30Li_2O$-$55P_2O_5$-(10-x)MgO-xCr_2O_3 ($0 \leq x \leq 1$ mol%, x = 0, 0.1, 0.3, 0.5, 0.7, 0.9) glasses were investigated. The specimens were prepared by following melt quench and heat treatment techniques. The amorphous nature of glasses was asserted by X-ray diffraction. Physical parameters of the glasses were estimated. These parameters supported the compact nature of glasses. Optical absorption spectra of glasses evinced the bands due to the Cr^{3+} ions. The optical band gap (E_g), and Urbach energy (ΔE) of the samples were evaluated. FTIR and Raman spectra exhibited the traditional bands due to phosphate groups. Electron spin resonance (ESR) and Emission spectra confirmed the presence of chromium ions in the glasses. An increase intensity of ESR resonance signals and Emission bands suggested the amplification of chromium ions. The dielectric parameters of the samples were (dielectric constant, ε', dielectric loss, $\tan\delta$, and a.c. conductivity, σ_{ac}) determined. The conductivity of samples is expected due to both electronic and ionic conduction.

MUNICIPAL SOLID WASTE MANAGEMENT AND GEOGRAPHICAL COVERAGE IN KADAPA

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Abstract: SWM (Solid Waste Management) is a global phenomenon. Human beings face a major difficulty all around the planet. The things that are urbanization and industrialization caused to face this problem in city municipalities. The issue of Municipal Solid Waste Management (MSWM) is also present in the Kadapa town environment in India. As a result, for the current research it was, considered major waste generated areas. The present study discussed the how much is the waste generated per area, per head and how the municipal corporation of Kadapa is helping people to avoid throwing at nearby places. Municipality of Kadapa is much more engrossed to avoid the effluence caused by the waste. Also discussed that, what are the methods of customs associated with sources, quantity generated, collection, transportation, storage, treatment and disposal of municipal solid waste by the municipality of Kadapa.

Key words: Solid Waste management, Urbanization, Population

ORDER PARAMETER OF MEASUREMENTS FROM THE LINEAR DICHROISM OF LIQUID CRYSTAL USING TEXTURE ANALYSIS.

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Abstract:

A novel approach of texture analysis is proposed to measure the order parameter of liquid crystals using liner dichorism. In this approach, dichroic ratio (R) is computed from the maximum absorption of textural intensities polarized parallel and perpendicular to the optical axis is used. For this, textures of the liquid crystals as a function of temperature are recorded from the parallel and crossed polarizer's condition using POM with camera attachment. Absorption of textural intensities from the transmitted textural intensities of liquid crystals are given by the relation of Lambert-Beer law. Here, nematic liquid crystal: *p*-*n*-alkyl benzoic acids (*n*BA, here *n*=6, 8) are considered for investigation. Results obtained from this methodology shows that the texture analysis is simple and effective technique to investigate the physical properties of liquid crystals. The validity of this novel method was confirmed by comparing the order parameter measurements of other techniques in literature.

Key words: Transmission, Absorption, Liquid crystals, Texture analysis, Order parameter.

REFRACTIVE INDEX MEASUREMENTS OF BINARY MIXTURES FROM THE ANALYSIS OF FTIR SPECTRAL DATA USING TRANSMISSION METHOD.

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A new method is proposed to determine the refractive indices of binary mixtures of liquids from the analysis of FTIR spectral data. The wavelength dependence of spectral intensities transmitted by the binary mixtures has been recorded at various concentrations and refractive index measurements are carried out using transmission method. This method involves the finding of maximum and minimum transmitted intensities of functional groups of spectral data using Graphical tool Origin. Here, polar molecules Propylene glycol (PG) and Hexanol with different molar ratios from (PG + Hexanol: 0.1 + 0.9 to 0.9 + 0.1) are considered as binary mixtures. Intermolecular interactions between these two polar molecules give the hydrogen bonded liquid complex systems. Refractive indices of the binary mixtures are sensitive to the shifts in the vibrational frequencies caused by the molecular interactions of functional groups. Results obtained from this methodology show that, refractive indices of binary mixtures are influenced by the molar ratios of binary mixtures (PG + Hexanol: 0.1 + 0.9 to 0.9 + 0.1) and hydrogen bond formation.

Key words: Refractive index, Fourier transform Infrared spectroscopy, binary mixtures, intermolecular interactions, Transmission.

EFFECT OF VISCOUS DISSIPATION ON MHD FREE CONVECTIVE FLOW THROUGH A POROUS MEDIUM

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ABSTRACT

The aim of this paperis to study the convective heat and mass transfer over a vertical porous plate with viscous dissipation. Using the similarity transformations, the governing equations have beentransformed into a system of ordinary differential equations. These differential equations arehighly nonlinear which cannot be solved analytically. Therefore, Runge–Kutta shooting technique has been used for solving it.The impacts of several physical constraints on velocity, temaparature and concentration are showned graphically. It is noticed that velocity profiles decrease with an increase in Magnetic parameter, temperature increases with the increase on Eckert number.

Key words: MHD flow, Vicous dissipation, porous medium

GRASS WITH BIO SENSOR PROPERTIES

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Abstract :

The excess use of Materials and unsafe chemicals has led to pollution and Serious health issues. The use of Bio sensor is riskless for human and environmental health. This Sensor at different temperatures on Interaction with a chemical substance makes Clock wise and Anti clock wise Directions . Here I reviewed the Development of Bio Sensors and their applications on Medical Sciences. The sensor is user friendly and needs low volume of Chemical sample for Analysis.

Keywords : Temperature, Biological Component , physiochemical component, Biodegradability, low volume sample, user friendly.

BUOYANCY FORCE EFFECTS ON UNSTEADY MHD FREE CONVECTION FLOW OF NON-NEWTONIAN JEFFREY FLUID PAST AN INFINITE INCLINED PLATE THROUGH POROUS MEDIA IN THE PRESENTS OF HEAT SOURCE AND CHEMICAL REACTION

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Abstract: The study of buoyancy force effects on non-Newtonian non-steady MHD free convection flow the dimensionless, unstable, coupled, linear Laplace transform method is used to solve partial differential equations by passing a fluid past an infinite inclined plate through porous media while simultaneously presenting a heat source and a first-order chemical reaction in the diffusing species. Analyses and graphical displays are provided for all pertinent flow parameters. Graphs and tables are used to quantify and discuss the impacts of different flow quantities on temperature, concentration, frictional pressure, the velocity factor, and the rate of mass and heat transmission.

Keywords: Thermal radiation, chemical reaction, Jeffrey fluid and heat source.

CONCEPT OF MULTICULTURALISM AND E L T

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Abstract: The global language i.e. English has taken a prominent place in teaching and learning. Though many languages and cultures exist in the world, English language is preferred in the teaching and learning process for better understanding of content, cultures, and new knowledge in any field throughout the world. English has already become an inevitable part of education in most countries. Moreover, the English language provides the opportunity to understand all the cultures, attitudes, and behaviour of people comprehensively.

Multiculturalism is the dogma that various cultures (rather than one national culture) can coexist peacefully and fairly in a single country. If multiculturalism is taken in an educational context, it refers to any form of education or teaching that integrates the histories, writings, values, opinions, and perceptions of people from different cultural backgrounds. If we take an example, at the classroom level, teachers may change or incorporate lessons to reflect the cultural diversity of the students in a particular class. One of the major challenges is how the teaching of English can be made appropriate in multilingual and multicultural contexts. Because the learners are from various backgrounds in terms of language and attitudes. Undoubtedly, teachers of English as a Second Language have a unique opportunity to foster their students' awareness of and appreciation for the diversity of the world by creating a multicultural classroom environment.

This research explores the perspectives of educators on diversity and the methods they use in the classroom to facilitate positive relationships between students from different cultural origins via the medium of language instruction.

Key Words: Multiculturalism-Inclusive Classroom-Classroom Incivilities-Positive Interactions

CHARACTERIZATION TECHNIQUES OF ERBIUM DOPED $CaZrO_3$ PHOSPHOR

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Abstract. $CaZrO_3$ are important materials for different applications. They are used in field emission displays, 3-D display technology, Laser devices, Solar cells and in Sensors. The rare earth elements had and still have unique and important effect on our day to day lives. The unfilled 4f electronic structure of the rare earth elements makes them to have special properties in luminescence which could be used to develop many new materials for various applications. Few authors have characterized optical properties of rare earth doped $CaZrO_3$, $CaTiO_3$, $SrTiO_3$.This paper deals with the synthesis and characterization techniques of Er^{3+} doped $CaZrO_3$ phosphor.

Erbium(Er)-2.0 wt%,2.5 wt% doped$CaZrO_3$ phosphors were prepared by using Solid State Reaction method. The Luminescent properties,Crystal structures and Crystal sizes of $CaZrO_3$ were Studiedusing SpectroFluorometer,X-ray diffraction(XRD), Scanning Electron Microscope (SEM) and Fourier Transform Infrared Spectroscopy(FTIR). The Photo Luminescence spectra show peaks in green region. The crystallite size lying in nano range.

Key Words: Luminescence, XRD, SEM,FTIR

CONVECTIVE FLOWS OF PRANDTL HYBRID NANOFLUID (SWCNT-MWCNT/EG) OVER AN EXPONENTIAL ELONGATED SHEET WITH SECOND-ORDER SLIP CONDITION

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Abstract: The convective flow of Prandtl hybrid nanofluid (SWCNT-MWCNT/EG) past an exponential elongated surface with second order slip condition is investigated in this paper using a simplified mathematical model. To analyse the flow, an external inclined magnetic field is applied. Single wall (SWCNT's) and multiwall (MWCNT's) carbon nanotubes are considered as the nanoparticles with ethylene glycol as base fluid. By using similarity transformations, the governing equations in the current study along with boundary conditions are turned into a highly nonlinear system of ODEs and are solved by using integrated shooting scheme. For selected flow parameters, graphs for velocity, fluid temperature heat transfer rate and skin friction factor are shown. It is established that the heat transfer rate enhances with an increase in the Biot number and Prandtl number.

Keywords: SWCNT-MWCNT hybrid nanofluid, Prandtl fluid, Biot number, Inclined Magnetic Field, Second order Slip, Exponential stretching sheet.

Effect of thermal diffusion on unsteady MHD Casson fluid flow past a semi-infinite vertical plate

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Abstract: The process design engineers are concerned with efficient heat and mass transfer, in many engineering processes such as paper manufacturing, metal and polymer extrusion etc. Also, many industrial fluids are non-Newtonian. So, an attempt is made to discuss the unsteady MHD flow of a Casson fluid past a semi infinite vertical plate with thermal diffusion, radiation and heat absorption effects. Slip boundary constraints are also considered for this investigation. The governing partial differential equations are reduced into non-dimensional ordinary differential equations and solved analytically using perturbation technique. The effects of various non dimensional governing parameters on velocity, temperature and concentration fields along with the friction factor, local Nusselt and Sherwood numbers are discussed in detail and presented through graphs and tables. Moreover, it is seen that higher values of the Soret number enhance the velocity and concentration profiles. It is also observed that the Schmidt number have tendency to enhance the mass transfer rate and radiation parameter have tendency to increase the thermal boundary layer thickness. It is also observed that our results are in well agreement with earlier results.

Keywords: Unsteady flow, Casson fluid, MHD, Radiation, Soret effect

SPECTROSCOPIC INVESTIGATIONS AND PHOTOCATALYTIC STUDIES OF Cr(III) IONS DOPED $K_2Ba_3(P_2O_7)_2$

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ABSTRACT

Now-a-days, anhydrous inorganic metal phosphate compounds have been part of intensive research activities and their number has grown steadily as these compounds are usually accompanied with intriguing magnetic, electric, optical and thermal properties. A ternary new metal diphosphate $K_2Ba_3(P_2O_7)_2$doped with Cr(III) ionsis successfully prepared by solid state reaction method. The prepared sample is characterized by XRD, Raman, Optical absorption, Election Paramagnetic Resonance and photocatalytic studies. From the X-ray diffraction the average crystallite size is calculated as 24 nm which confirms the prepared sample is in nano-size. Unit cell parameters are obtained, they are a = 0.5602, b = 0.9414, c = 1.3879nm. The evaluated lattice parameters are agreed well with reported earlier.Vibrational energy modes aremeasured from Raman Spectrum. From optical absorption the absorption edgeis found to be at 334 nm. From EPR spectrum, g value is calculated as 1.939 which confirm the Cr(III) ions in octahedral coordination in the host. By correlating Optical and EPR studies the Cr^{3+} ion is in distorted octahedral site symmetry. Photocatalytic behaviour is exhibitingreduced $1/3^{rd}$ of the illuminated light against, which indicates that this prepared sample may be used for good laser host materials.

Structural, Optical and Morphological studies of Cu^{2+} doped ZnS nanocrystals by co-precipitation method

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Abstract: In the current work, 0.01 mol % of Cu^{2+} doped ZnS nanocrystal was prepared by a co-precipitation method. The prepared nanocrystals are studied by XRD, SEM with EDS, TEM, Optical absorption, FT-IR, EPR and TG-DTA. From the XRD data analyses the crystallite size, dislocation density, and macrostrain of the prepared sample. The average crystallite size is in the order of 12 nm. SEM and TEM studies exhibit the morphological studies of the prepared sample. EDS spectrum shows the composition of various atoms present in the prepared sample. FT-IR confirms the various vibrational modes present in the sample. Optical absorption studies exhibit the characteristic of Cu^{2+} bands in visible region, and the tetragonal field parameters are calculated as Dq = 1168, Ds = 1588, Dt = 407 cm^{-1}. The values of g (Hamiltonian parameters) and A (Hyper fine coupling constant) from EPR spectrum are calculated as $g_{\parallel}$= 2.3504, $g_{\perp}$ =2.0873, $A_{\parallel}$= 124 and $A_{\perp}$= 57 x 10^{-4} cm^{-1}. TG-DTA curve enables us the weight loss of the sample with increase in temperature.

Mn^{2+} doped $SrSn(PO_4)_2$ nanopowder by solid state reaction synthesis and characterizationfor luminescentapplications

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ABSTRACT

Mn^{2+} doped strontium tin phosphate $SrSn(PO_4)_2$nanopowder was prepared by solid state reaction method. The prepared nanopowder was characterized by structural, spectral, optical, and luminescence investigations. Crystallite size, phase of the sample was explained by powdered XRD analysis. FTIR study will give the fundamental symmetric and asymmetric modes of vibrations of host lattice. Optical absorption analysis will give the typical bands in visible region. EPR studies exhibited resonance signal and site symmetry is ascribed as octahedral site. PL spectrum shows different emission bands of various color regions. CCT value is greater than 5000k; this is useful for warm white light LED applications. The CIE co-ordinates explain the color precipitation of the prepared nanopowder.

Effect of Cu^{2+} doping on the structural and optical properties of $ZnAl_2O_4$ nanosheets

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Abstract: Researchers have paid a lot of attention to bimetallic oxide-based spinel nanostructures because of their exceptional qualities and distinctive crystal structure. Spinel $ZnAl_2O_4$ (ZAO) is suitable for possible applications due to its large active surface area, mechanical strength, great thermal stability, and chemical stability. ZAO has been acknowledged as one of the most researched materials in the developing domains of photocatalysis, hydrogenation of CO_2, supercapacitors, and photoluminescence. It is a large bandgap (3.38 eV) semiconductor with a typical spinel structure.A and B are divalent (2+) and trivalent (3+) metal cations that occupy the tetrahedral and octahedral positions, respectively, in the ZAO structure, which is typically depicted as an AB_2O_4 spinel structure. ZAO is a fantastic host semiconductor because it may be doped with different transitional or rare earth metal ions. Doping with foreign substances results in bandgap tuning, which has superior electrical properties. Additionally, by adjusting the synthesis techniques and parameters, it is possible to tailor the bandgap of ZAO by regulating the size and morphology of nanostructures.

In the current study, the hydrothermal route has been successfully used to synthesize both pure and Cu-doped ZAO nanosheets. Single-phase cubic spinel structure of ZAO was verified by XRD investigation. With the doping of Cu ions, the shape of ZAO drastically changed from micro-hexagons to nanosheets. The presence of Zn, Al, O, and Cu in 2+, 3+, 2-, and 2+ oxidation states, respectively, is confirmed by the XPS spectra of Cu doped ZAO. Cu-doped ZAO nanosheets have a narrower bandgap than pure ZAO. The produced material can be employed as a possible contender for energy-based applications because of the variable bandgap.

Keywords: $ZnAl_2O_4$Nanosheets, Cu-doping, Energy Bandgap, XPS spectroscopy

Influence of Transition Metal Ions Doping on Structural, Optical and Photocatalytic behaviour of ZnO-CdS nanocomposites under visible light

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Abstract: As essential components for the creation of the next generation of solar energy conversion devices, which have high performance and innovative capabilities like flexibility and mobility, oxide-based nanostructured materials have received a lot of attention recently. Numerous semiconductors, including metal oxides, metal sulfides, and composites, have undergone in-depth research. Due to its high exciton binding energy (60 meV), rapid generation of photo-excited electron-hole pairs, and high photocatalytic activity under UV light irradiation, ZnO, an important direct wide band gap semiconductor (3.37 eV), has attracted interest for photocatalytic application. But in contrast to TiO_2, ZnO photocatalyst has some drawbacks that restrict its further use, including its low and constrained photoconversion efficiency, the ease with which electron-hole pairs can recombine, and its propensity for photocorrosion.Numerous ZnO-based nanocomposites with diverse morphologies have been described to enhance the material's physical and chemical properties in order to get around these disadvantages. The exceptional performance of ZnO-CdS nanocomposites in optics, electronics, light emitting devices, photocatalysts, and photovoltaic cells has led to substantial research into this group of materials. The band alignment between ZnO and CdS according to their relative energy band locations improves photoconversion efficiency even though ZnO and CdS share the same crystal structure, i.e., hexagonal.

This combination of the two semiconductors lowers the excited energy and increases the range of light response. Therefore, the concept of combining CdS and ZnO has been intriguing and opening up new possibilities for study, but it was insufficient for practical applications.Due to the amazing characteristics of transition metal ions, such as high electron mobility and good optical transparency, a wide range of uses were anticipated with their

discovery. Future manufacture of semiconductor devices might benefit from these semiconductor nanoparticles. The influence of transition metal ions doping on ZnO-CdS nanocomposites' structural, optical, and photocatalytic capabilities was examined in the current work. Studies using X-ray diffraction show that ZnO and CdS are both in the hexagonal phase. The formations appear to be spherical in SEM and TEM micrographs. Different bands could be seen in the UV, blue, green, and red areas of PL spectra. The addition of transition metal ions considerably increased the photocatalytic effectiveness of ZnO-CdS nanocomposites. Cu doped ZnO-CdS nanocomposites have the best catalytic performance among the doped samples.

Keywords: Transition metal doping; ZnO-CdS nanocomposites; X-ray diffraction; Photocatalysis

Enhanced visible-light driven photocatalytic activity of Cu doped ZnO-SnSnanocomposites

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ABSTRACT

A novel hydrothermal technique is used to fabricate Cu doped ZnO/SnS nanocomposites at 220 °C for 12 hours. Utilizing several experimental approaches, including XRD, XPS, TEM, and UV-DRS, prepared nanocomposites are characterised in all aspects, including structurally, morphologically, and optically. Additionally, the photocatalytic activity (PCA) was investigated for the effectiveness of degrading the methylene blue (MB) model pollutant dye under visible light irradiation. The mixed phase abundance with orthorhombic SnS and hexagonal ZnO was confirmed by XRD. More agglomeration of doping ions was observed in TEM micrographs. Cu atomsoxidation state was confirmed as 2+ by XPS along with the other elements in the composition.The bandgap red shift in the UV-DRS was accompanied by an increase in doping content. Under visible light exposure, the measured MB dye degradation is greater than 97% after 120 minutes. The argument for enhanced PCA was based on the heterogeneous semiconducting materials' tunable energy bandgap properties and the efficient charge carrier (electron-hole) separation on the surface of nanocomposite. The hypothesised physical mechanism for the conversion of charge carriers from one band to another band and vice versa when light illumination is present was then provided.

Hydrothermally synthesized Fe doped $ZnAl_2O_4$ nanosheets for room temperature ferromagnetism and bandgap engineering

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Abstract

In this study, co-precipitation assisted hydrothermal synthesis at 220 °C for 8 hours was used to create well-separated Fe-doped $ZnAl_2O_4$ nanosheets. X-ray diffraction (XRD), transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), UV-diffuse reflectance spectroscopy (UV-DRS), and vibrating sample magnetometer (VSM) techniques were used to evaluate the nanosheets as they have been synthesized. The diffraction patterns show that the doped Fe ions have no discernible impact on the $ZnAl_2O_4$ crystal structure. Additionally, this supports the production of pure spinel crystals and crystallinity. Additionally, there were no recognizable diffraction peaks connected to any impurity, cluster formation, or secondary phase of Fe.The existence of target elements including Zn, Al, O, and Fe is confirmed by the XPS spectra of Fe-doped $ZnAl_2O_4$. Additionally, it is confirmed that the optimum sample ZAO-Fe-3 (i.e., $ZnAl_2O_4$ doped with 3% Fe ions) contains mixed oxidation states, i.e., Fe^{2+} and Fe^{3+}. While the Fe-doped $ZnAl_2O_4$ has a nanosheet-like shape, TEM pictures of pure $ZnAl_2O_4$ show a micro-hexagonal structure. The bandgap energy of $ZnAl_2O_4$ is modified by Fe doping as the Fe content rises, according to DRS analysis. M-H hysteresis curvesof Fe-doped $ZnAl_2O_4$ clearly showed ferromagnetism at room temperature.

Keywords: $ZnAl_2O_4$; Fe-doping; Energy Bandgap; Ferromagnetism.

Synthesis and structural characteristics of CeO_2- $BiVO_4$ nanocomposite

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ABSTRACT

The rate of urban expansion and population growth has resulted in a marked decline in water quality recently. So, it is vital to create an efficient technique to remove contaminants from wastewater. Among the sophisticated oxidation techniques, photocatalysis is a great tool for removing contaminants from hard water. Cerium oxide (CeO_2) is a promising material for its widespread use in photocatalysis, due to its superior qualities, including low toxicity, low cost, high chemical stability, and strong oxygen storage capacity. The formation of abundant oxygen vacancies can lower electron-hole recombination and enhance photocatalytic activity. However, single CeO_2 is still unsatisfactory due to low specific surface area, large bandgap with lower absorption in visible regions up to 400 nm, and high electron-hole recombination. Hence, the modification of CeO_2 is needed to overcome the shortcomings. Combining CeO_2 to other semiconductors like $BiVO_4$ of smaller bandgap can greatly improve the photo-degradation performance. $BiVO_4$ has a band gap energy of 2.4 eV and can absorb the solar spectrum fraction up to blue light. So the combination as nanocomposite with CeO_2 can alter the photodegrdation capabilities into visible light.

In the present research work, CeO_2- $BiVO_4$ nanocomposite was prepared in hydrothermal method. The prepared sample was examined through structural characterizations X-ray diffraction, SEM with EDS and FT-IR studies. XRD pattern of the prepared sample reveal the monoclinic phase of the sample and average crystallite size is found in nanoscale for both CeO_2 and $BiVO_4$. SEM micrographs show the surface morphology of the sample as agglomerated spherical structure. EDS pattern exhibits the presence of targeted elements in the sample that confirms the purity of the sample as well. FT-IR spectrum gives the presence of functional groups involved in the prepared sample.

Keywords: CeO_2– $BiVO_4$nanocomposite, Photocatalysis, XRD, SEM.

Hydrothermal synthesis of novel $CeO_2/InVO_4$ nanocomposites for improved visible-light driven photocatalytic performance

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Abstract

The question of environmental contamination is increasingly being discussed in relation to the evolution of human society. The photocatalysis method has received a lot of attention since it offers a potential remedy for cleansing waste water and producing energy. Since it can be used to decompose organic contaminants, semiconductor photocatalysis has gained more and more attention in recent years. Due to its outstanding ability as a visible light-driven photocatalyst, indium vanadate ($InVO_4$) has been the subject of much research. However, because of narrow bandgap, quick charge recombination at its surfaces has severely constrained further advancements in photocatalytic activity.Thus, it is essential to create efficient strategies for enhancing charge separation efficiency and expanding the spectral sensitive range. To increase optical absorption and the separation of electron-hole pairs, the linked metal oxide with matched band potentials has been formed into a composite. Due to its great photocatalytic efficacy, cheap cost, nontoxicity, and high stability, cerium dioxide (CeO_2) is a chosen material for coupling with $InVO_4$ for the destruction of organic contaminants.

In the current study, a unique hydrothermal $CeO_2/InVO_4$ composite photocatalyst that is driven by visible light was effectively created. X-ray diffraction (XRD), transmission electron microscopy (TEM), UV-vis DRS, and photoluminescence methods were used to characterise the photocatalysts. Under visible light illumination, the synthesised $CeO_2/InVO_4$ composite was used as an effective photocatalyst for the photocatalytic degradation of methylene blue (MB), which results in the degradation of MB (79%) in 120 minutes. The improved photocatalytic performance of $CeO_2/InVO_4$ results from more adequate interfacial interaction between CeO_2 and $InVO_4$, which results in increased photogenerated charge separation, transportation efficiency, and photoresponsive range.

Visible-light-driven indium vanadium oxide nanosheets supported bismuth tungsten oxide nanoflakes photocatalyst for the efficient removal of tetracycline

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Abstract: The development of excellent photocatalysts is of great significance for the efficient photocatalytic degradation process, however, the low carrier separation efficiency and poor light absorption ability typically limit the performance of photocatalysts. Herein, a visible light responsive heterostructure composed with indium vanadium oxide nanosheets supported bismuth tungsten oxide nanoflakes ($InVO_4/Bi_2WO_6$) was synthesized through *in-situ*hydrothermal method. Further, the photocatalytic activity was performed for tetracycline (TC) under visible light illumination. The $InVO_4/Bi_2WO_6$heterostructure builds a strong interface between $InVO_4$ and $Bi_2WO_6$to hinder reunion of photo generated charge carriers, and provides the active sites to trap photo generated electrons to participate in the removal of TC. In particular, the $InVO_4/Bi_2WO_6$photocatalyst prepared by taking 5.0 mg of Bi_2WO_6shows the highest degradation of TC about 97.42% in 72 min. The quenching experiments identified that hydroxyl radicals, and holes dominated in the degradation of TC over the optimal photocatalyst. Furthermore, the optimized nanocomposite is stable even after four cycles, which exposes the excellent photo stability and reusability of the photocatalyst. In addition, a plausible degradation pathway and mechanism of TC over $InVO_4/Bi_2WO_6$nanocomposite under visible light irradiation is also proposed.

Keywords:$InVO_4$; Bismuth-based; Heterostructure; Tetracycline; Visible light irradiation; Photocatalytic mechanism

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Synthesis, Characterization, and *In-vitro* Bioactivity of Melt-derived Bioactive Glass

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Abstract: Development of new composite materials for bone tissue engineering is a constantly growing field of medicine. Bioglass were synthesized using the conventional melt-quenching technique. The prepared bioglasses were primarily characterized by X-Ray diffraction (XRD), Scanning electron microscopy (SEM-EDS), and Fourier transform infrared spectroscopy (FTIR). In particular, the ability of the system to form hydroxyl apatite (HAP) upon SBF treatment for different days by immersion at 37 ^{0}C, pH 7.4 was tested. XRD patterns of the immersed smples revealedtheir crystalline nature, proving their ability to form hydroxyl apatite. SEM-EDX analysis of the samples showed the surface morphology and confirmed the elements present in the sample. The release of Ca^{2+} and PO_4^{3-} ions from glass matrix, based on studies confirming the PO_4^{3-} bonding crystalline modes are related to the formed HAP layer. The Calcium phosphate based bioglasses are easier to be produced, biodegradable and biocompatible with many human connective tissue cells. The measurements of antibacterial activity of bioglasses against E. coli, S. aureus, carried out for 24h have confirmed their potential antibacterial activity. Therefore, their synthesis using suitable chemical composition and their structural characterisation helps to understand and tune their use as a highly effective implant material for bone regeneration applications.

Keywords: Bioactive glasses, *in-vitro* bioactivity, Antibacterial Activity, Cytocompatibility

In vitro biological properties of Manganese ions intoBoro-bismuth bioactive glasses for bone regeneration applications

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Abstract:

The usage of bioactive materials in clinical application has been extensively increasing day by day as they serve as an implant to heal or to compensate for bone loss or damage. The use of various glass systems by taking advantage of trace metal ions for their biomedical applications is indeed increasing research and development activities. This study presents the effect of addition of Manganese (MnO) on structural and *in vitro* bioactivity properties of optimized bismuth borate glass. The bismuth borate glasses containingMnO have been prepared by melt-quenching method. Physical, structural and *in vitro*biological properties were evaluated. *In vitro* bioactivity was studied by soaking glass samples in simulated body fluid (SBF). X-ray diffraction, FTIR Spectroscopy and Scanning electron microscopictechniques were used to estimate the bioactivity of glass samples. Antibacterial activity was tested against E. Coli and S. aureus bacterial microbes by disc diffusion method. *In vitro* bioactivity study demonstrated good hydroxyapatite formation rate on the surface of glass samples with increase in pH of SBF solution, MnOconcentration up to 2 mol.%, but higher concentration of inhibited the formation of hydroxyapatite layer.

RESTORATION OF URBAN DRAINAGE WASTE WATER WITH DECENTRALIZED: PHYTORID BASED WASTE WATER TREATMENT SYSTEM

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Abstract

Water Scarcity and wastewater managements are two major challenges that affect the ecosystem and the urban environment. In a tropical country such as India, wastewater reuse should be encouraged whenever it is safe and economically feasible. There are many methods for wastewater treatment. This project methodology consists of a theoretical study about water reuse, treatment and constructed wetlands. Adequate water and wastewater management, essential for human health and economic development, poses a major challenge to many countries around the globe. Whereas in the industrialized countries water and wastewater control had reached a fairly high standard, in developing countries severe problems with respect to water supply and wastewater management are still apparent. Water supply systems, even though we have wastewater treatment techniques but we are not able to implement on site because of high installation cost and need skilled man power it is difficult to maintain. So the wastewater treatment lags behind and remains a major challenge. So there is a need to develop suitable low cost and eco-friendly technology for the urban sewage wastewater treatment which is easy to implement and maintain. By achieving wastewater reuse the waste lands and barrel lands are turn in to gardens and forest lands for future sustainability.

Key words: waste water managements, economically feasible, constructed wetlands, water supply, wastewater treatment, sustainability

Acidic nature Ionic Liquid catalyzed synthesis of quinoxaline and its derivatives

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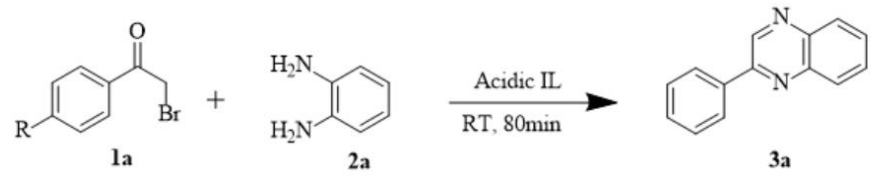
Abstract

Phenacyl bromide and *o*-phenylenediamines have been used in a straightforward, effective, and ecologically friendly ionic liquid-mediated approach for the synthesis of quinoxaline derivatives. An acidic ionic liquid has been created, examined using IR, ^{1}H, and ^{13}C NMR, and used as a catalyst and solvent in the aforementioned technique. It was determined how effective IL's catalytic activity was, and the connection between that activity and acidity was explored. The most efficient, environmentally sustainable, and reasonably appraised solvent and catalyst for the aforementioned processes was also discovered to be ionic liquid.Because ionic liquid is environmentally benign and this approach doesn't use a separate catalyst to speed up the reaction, it has great utility. In terms of acceptable to exceptional yields, rapid reaction times, easy set-up, straightforward recovery, and the possibility to reuse ionic liquid five times, the protocol demonstrates its efficacy and environmental friendliness.



R = -H, $-CH_3$, $-CH_2CH_3$, $-NO_2$, -Cl

Water Quality Assessment of the Madduvalasa Reservoir of Vizianagaram District of Andhra Pradesh

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Abstract

The authors present work deals with the assessment of the water quality of the water samples collected from Madduvalasa reservoir situated in Vizianagaram district of Andhra Pradesh, by analysing some selected physicochemical parameters and chosen heavy metals. The water samples that were collected from the reservoir were subjected to analyses for water quality parameters like pH, EC, DO, COD, BOD, TDS, total hardness, calcium, magnesium, sodium, potassium, iron, chloride, nitrite, phosphate, carbonate, and bicarbonate as well as heavy metals like zinc, manganese, lead, and chromium. The findings were evaluated against the BIS standard values. Analysis of the parameters SAR, RSC, and Mg Hazardous revealed that all of these values fell within the permissible limit. The results of the analysis showed that the water samples have saturation index values in the range of 0.4-0.92, which means that the water is supersaturated in terms of calcium carbonate (CaCO3) and may produce scale but is not corrosive.

Keywords: Madduvalasa reservoir, dams, water quality, physicochemical parameters

ULTRASONIC STUDIES OF PEG INTERACTIONS IN AQUEOUS SOLUTION

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Abstract

Alcohols are significant amphiphilic substances for both biology and industry. They are liquid because of hydrogen bonding between their O-H groups. They are self-associated, polar liquids. PEG is a type of polymeric substance with a range of molecular weights. The PEGs might be either liquid or solid. PEGs with a lower molecular weight are liquid, whereas PEGs with a greater molecular weight are solid. Studying how ultrasonic waves go through liquids, liquid mixtures, and solutions can be highly helpful for figuring out the types of intermolecular interactions that are present in a system. The structure of the molecules and their interactions with one another determine the ultrasonic velocity, which is a crucial characteristic. In the current experiment, aqueous solutions of the polyethylene glycols 200, 400, 2000, and 4000 are measured for their ultrasonic velocities (U) and densities (ρ). From the measured values of "U" and "," various acoustical parameters including adiabatic compressibility (β), acoustic impedance (Z), and free length (Lf) are determined. When employing the B/A ratio and the Ballou equation to calculate nonlinear parameters, the Hartmann and Balizer equation is utilised. The essentially linear relationship between B/A fluctuation and concentration suggests that the mixture's component elements do not form complexes. In order to determine the presence of certain interactions between solute and solvent type in the PEG-water system, acoustical parameters were used.

Keywords: Poly(ethylene) glycols,Acousticalparameters,Ultrasonicvelocity

EFFECT OF CHEMICAL REACTION ON MHD BOUNDARY LAYER FLOW OF A NON-NEWTONIAN FLUID

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This paper describes the impact of chemically reaction in boundary layer flow of a Casson fluid in the presence of porous medium. The similarity variables are used to convert governing equations into a system of ODEs and are then computationally addressed using shooting method. The results are investigated numerically through graphs for velocity, temperature and concentration distributions. Numerical outcomes are compared with available results which are in good agreement. The outcome of this work showed that Casson parameter reduces thevelocity field while as the temperature is temperature is improved with increasing Casson parameter.

Keywords: Casson Parameter, Non-Newtonian fluid, porous medium

A Logistic Regression Model for Analysing the Default Risk of Housing Finance Companies

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Abstract: Logistic regression was applied to classify and determine the influencing factors affecting the scores of the demographic factors. One type of logistic regression is cumulative logistic regression, in which latent variables connect functions that determine the values of demographic factors, which are dynamic in nature. Multivariate logistic regression describing the dependence of loan repayment of housing loans. This paper employs credit theory by combining the credit bureau's switching application with a borrower's behavioural switching matrix extracted from the loan borrower's demographic profile and defaulter of loan repayment.

Bianchi type-*II* cosmological model in the presence of massive scalar field in *f(R,T)* theory of gravity

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Abstract: In a modified theory of gravitation known as *f(R,T)* gravity (Harko et al. Phys. Rev. D **84**: 024020, 2011), the focus of this study is the investigation of a spatially homogeneous anisotropic Bianchi type-II cosmological model in the presence of a massive scalar field. Here, T is the trace of energy momentum tensor, and R is the Ricci scalar. In this theory, we obtain an exact solution to the field equations. Cosmological features of the model are found and their physical significance is examined.

Dynamics of Sharma-Mittal holographic dark energy model in Brans-Dicke theory of gravity

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Abstract

The Sharma-Mittal holographic dark energy is studied in this research work usingthe Brans-Dicke scalar-tensor theory of gravity with a background of spatially homogeneous and anisotropic Kantowski-Sachs space-time. We use the Brans-Dicke scalar field $\varphi(t)$ as afunction of the average scale factor $a(t)$ in this case. The physical behavior of the modelis addressed using a graphical depiction to investigate the universe's accelerating expansion.Furthermore, the models' stability is tested using squared sound speed v_s^2. For our models, thewell-known cosmic plane $\omega_{de} - \omega'_{de}$is constructed. It is also worth noting that the conclusionsof deceleration, equations of state parameters, and the $\omega_{de} - \omega'_{de}$and statefinder planes areall consistent with modern observational evidence.

Study of FRW type Kaluza-Klein domain wall cosmological model in the presence of massive scalar field in a modified gravity

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Abstract

In this article we investigate the physical behavior of domain wall cosmological model in the presence of massive scalar meson field in Kaluza-Klein FRW type space-time in *f(R,T)* gravity formulated by Harko et al. (Phys.Rev.D 84, 024020, 2011). Here R is the Ricci tensor and T is the trace of the energy momentum tensor. To solve the field equations, we haveused (i) hybrid expansion law (Akarsu et al. JCAP, 01, 022 (2014)), (*ii*) varying deceleration parameter (Mishra et al. Int. J. Theor. Phys. 52, 2546 (2013)) and (*iii*) linearly varying deceleration parameter (Akarsu and Dereli. Int. J. Theor. Phys. 51, 612 (2012)).We have also studied some physical and kinematical properties of the model.It has been observed that our models exhibit a smooth transition from early deceleration to current acceleration of the universe and the present value of deceleration parameter is reasonably consistent with the observational data. Study of domain wall cosmological models will help to understand the early stages of evolution of the universe.

The role and importance of mathematics in societal development

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Abstract

"Without mathematics, there's nothing you can do. Everything around you is mathematics. Everything around you is numbers."

— Shakuntala Devi, Indian writer and mental calculator

"Mathematics as an expression of the human mind reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality."

— Richard Courant, German-American mathematician

"Nature is written in mathematical language."

— Galileo Galilei, Italian astronomer, physicist and engineer

"Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or the things of the world."

—Roger Bacon, English Franciscan friar, philosopher, and scientist

The history of mathematics shows that a society can achieve great development by placing a great deal of emphasis on mathematical skill. Mathematical knowledge is useful for both science and technology. All people have the right to study mathematics. Neither nations nor tribes or countries own this subject exclusively. The body of mathematical knowledge that exists today is the product of the combined efforts of all people. Therefore, saying that the history of mathematics was the history of civilization is not an exaggeration. Since all economic processes rely on information, mathematics is fundamental to business. There are

countless questions about how mathematics works, how it relates to the actual world, and why some equations should have a straightforward solution. Learning mathematics has a wide range positive benefits on our minds. It improves our ability to think clearly, fosters analytical thinking, speeds up our thinking, promotes pragmatism, and may be used in daily life.

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