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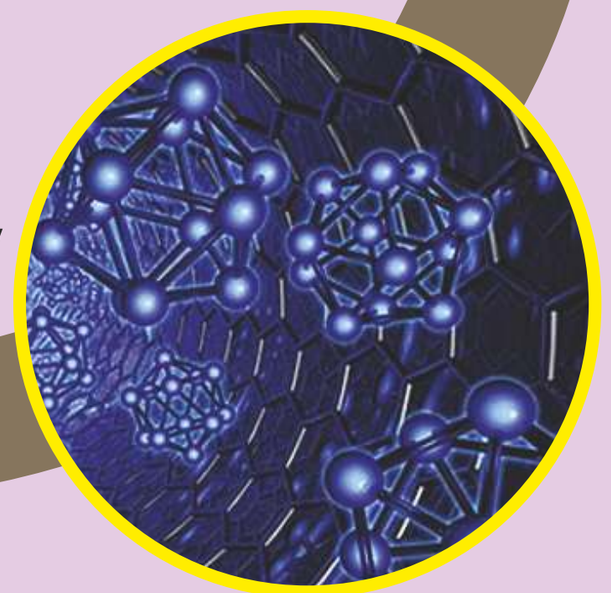

3-7 January, 2023
RTM Nagpur University
Nagpur

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14, Dr. Biresh Guha Street, Kolkata - 700 017
Tel.: 033-22874530/033-22815323, Fax: 033-22872551
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SECTION OF MATERIALS SCIENCE

THE INDIAN SCIENCE CONGRESS ASSOCIATION
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PROCEEDINGS
OF THE

108th INDIAN SCIENCE CONGRESS
NAGPUR, 2023

PART II
SECTION OF
MATERIALS SCIENCES

President: Prof. Guduru Prasad

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108th INDIAN SCIENCE CONGRESS
3 – 7 January, 2023
Nagpur

I

PRESIDENTIAL ADDRESS

President: Prof. Guduru Prasad

PRESIDENTIAL ADDRESS

Electrical and Electrochemical studies of $LiMe/M_{1-x}O_2$(Me/M=Fe, Co, Mn) for cathode materials of lithium ion batteries

G.Prasad and V Gangadhar
Department of Physics
Osmania University
Hyderabad- 500007

Since its first market introduction in 1991, the rechargeable lithium-ion battery (LIB) has proven to be a reliable energy storage device for consumer electronics and has the potential to power EVs because of its high energy density, light weight, low maintenance, long service life, and high efficiency. However, to maximize electrification of the road transportation system, LIB performance must be improved while reducing the cost and maintaining both maximum calendar life and safety.

A LIB is an electrochemical cell in which has two electrodes, a positive cathode and a negative anode. The anode and cathode are separated by a solid separator and filled with liquid electrolyte. During discharge, the positive ions migrate from the anode to the cathode and, simultaneously, electrons are generated from the anode and pass through the external circuit. In a typical LIB, graphitic carbon acts as an anode and a lithium-based layered metal oxide [*e.g.*, $LiMO_2$, where M is a transition metal (TM) ion such as Co, Mn, Fe or Ni] acts as a cathode separated by an insulating separator that is electrolyte-permeable.

Layered oxides with the formula $LiMO_2$ (M = Co, Mn, Ni) have been the most widely used/commercialized cathode materials for LIBs. $LiCoO_2$, the parent compound of this $LiMO_2$ family, was first suggested as the intercalation compound for rechargeable LIBs by Goodenough and Mizushima*et al*. in 1976; in the early 1990s they were commercialized by Sony Corporation. $LiCoO_2$ is the most used active cathode material for commercial LIBs. Depending on synthesis temperature, two types of crystallographic structures of $LiCoO_2$ are observed. At low temperatures (around 350 °C), a cubic spinel structure is formed that converts to a layered trigonal (also called hexagonal) at around 750 °C. The material with layered lattice shows better electrochemical performance compared to that with a cubic spinel lattice. The crystal structure of layered $LiCoO_2$ is compared to the α-$NaFeO_2$ type structure, which has space group *R*-3*m* with lithium and cobalt ions located in octahedral 3*a* and 3*b* sites, respectively, separated by layers of cubic close-packed oxygen ions. The unit cell of the layered form consists of three slabs

of edge-sharing CoO_6octahedra separated by interstitial layers of Li. The phase is also called the O_3 phase.

Another way to increase the doping level is to form mixed transition metal dioxides (MTMO). These are another kind of cathode material with a layered structure. Ni and/or Co are used as substitutes for Mn to stabilize the structure and simultaneously to increase the electronic conductivity of layered $LiMnO_2$. It has been found that the mixed transition metal dioxides tended to form $LiCoO_2$ (R-3m) analogy with a layered structure, but not in solid solutions of $LiCoO_2$, $LiNiO_2$, and $LiMnO_2$. The valence states of the ions were Ni^{2+}, Co^{3+}, and Mn^{4+}. During charge-discharge cycling, the valence state of Mn^{4+} remained unchanged. Several representative mixed layered compounds will now be discussed: (1) $LiNi_{0.5}Mn_{0.5}O_2$. Denoted as 550 material (0.5 Ni, 0.5 Mn, 0.0 Co), $LiNi_{0.5}Mn_{0.5}O_2$ was first reported by Rossen et al. in 1992.$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$. Denoted as 333 material (0.33 Ni, 0.33 Mn, 0.33 Co), $LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$ was first reported by Liu et al. in 1999.Wang et al. and Zhou et al. proved that 10% Al-doped 550 materials had a better thermal stability than $LiCoO_2$, $LiMn_2O_4$, and $LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$, and a higher volumetric energy density than both $LiMn_2O_4$ and $LiFePO_4$ materials. LiM1-y$(Li_{1/3}Mn_{2/3})_yO_2$. $LiM_{1-y}(Li_{1/3}Mn_{2/3})_yO_2$ represents Li-rich layered compounds, where M can be Cr, Mn, Fe, Co, Ni, or mixtures thereof. These materials are solid solutions of layered $LiMO_2$ and $Li(Li_{1/3}Mn_{2/3})O_2$.

In the present study, different Compositions as dopant were prepared. Structural, morphological, thermal, electrical and electrochemical propertiesof the samples were investigated using various characterization techniques. The Synthesised materials $LiM_xMe_{1-x}O_2$ (M/Me= Fe, Co, Mn) are characterized using PXRD, SEM, EDS, FTIR, Raman, AC & DC conductivity measurements. The electrochemical characteristics like CV, IV and CP of selected materials are used to identify the most efficient mechanism(s)/materials for electrical energy storage. The electrochemical impedance results reveals that the LMF electrodes not only improves the Li+ ion diffusion, but also efficiently enhances the specific capacity of material. LMF cathode material presents a good electrochemical performance. It shows a first discharge capacity of around 120 mAh/g at 1C rate; its capacity retention after 30 cycles is 90%.

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II

Abstracts of
KEYNOTE ADDRESS

FUTURE DIRECTIONS OF BIOMEDICAL MATERIALS:

Intelligent Biomedical Materials | Sustainable Biomedical Biomaterials

DR. SEERAM, RAMAKRISHNA, FRENG, EVEREST CHAIR

Professor of Mechanical Engineering and Bioengineering, Co-Director, NUS Nanoscience & Nanotechnology Initiative, National University of Singapore

E mail: mpesr@nus.edu.sg

Abstract

For millennia, thousands of biomedical materials have been sourced, developed and used for improved healthcare outcomes of humans. Eminent scholars grouped them into distinct types | classes to facilitate easy understanding. For example, natural biomedical materials and synthetic biomedical materials; polymers, composites, metals and ceramic biomedical materials; bioinert, bioactive and biomimetic biomedical materials; non-biodegradable and biodegradable biomedical materials. Thus, providing an overview of historical developments of diverse biomedical materials andclear knowledge of enabling scientific principles and advances. The accumulated knowledge coupled with recent rapid advancements in other fields of scientific research sets the stage for imagining future directions of biomedical materials. Smart | intelligent biomedical materials and sustainable biomedical materials are two front runner directions.

According to a study published in Lancet, by 2100, babies born today will be 78 plus and will live in a world in which older people outnumber the younger.Future demography is more akin to askyscraper instead of a pyramid. And growing demand for improved healthcare by people of all agescan be foreseen. Mental health to be on par with the physical health in importance. This lecture seeks to describe smart (responsive) | intelligent (autonomous) biomedical materials, devices, and systems in the service of stressful human living, aging population, unmet clinical needs, and future pandemics.

Climate change is one of the greatest global public health crises, yet healthcare remains among the most carbon-intensive sectors in the world, accounting for approximately 4% of greenhouse gas emissions. Greater than the aviation and shipping industries, healthcare's carbon

footprint has only been further exacerbated by the COVID-19 pandemic and looks set to continue to increase significantly in the coming decades. In addition, the generation of medical waste and associated pollution and social costs are on the rise. Net -zero healthcare systems by 2050 are pledged | envisaged. Materials | circular economy solutions have the potential to mitigate 45% of the total emissions. This lecture seeks to explain sustainable biomedical materials via the lens of net-zero emissions and resources | materials circular economy. Specific case studies and examples will be illustrated and discussed.

Recent Progress in the Processing of ZnO Nanoparticles for Food Packaging Applications

K. BYRAPPA*
Centre for Research and Innovations, BGSIT,
Adichunchanagiri University, 571448 Karnataka, India
*Email: kbyrappa@gmail.com

Abstract

Zinc oxide (ZnO) nanoparticles (NPs) are one of the frontier materials owing to their multi-functional properties whether it is physical, or chemical or biological characteristics. Accordingly, it is being used in a wide range of applications. Amongst them, the biological caracteristics are being explored extensively in recent years, especially in the food packaging applications. In fact, ZnO NPs are declared as generally recognized as safe by the U.S. Food and Drug Administration. When ZnO NPs are incorporated into packaging matrices for food packaging and preservation applications, several advantages have been reported. Some of the major challenges encountered in the conventional packaging materials include microbial contamination, oxidation, moisture, gas, and UV transmission into the food, and lack of mechanical strength. These factors result in poor shelf life, affect food quality, and cause food wastage. Recent progress in the processing of advanced packaging materials has shifted the attention towards nanotechnology, which facilitates in the fabrication and application of materials atnanoscale. Among various nanomaterials, current research has focused on ZnO NPs due to their properties and future applications. Incorporation of ZnO NPs into biopolymer packaging materials considerably enhanced the antimicrobial activity against foodborne pathogens and prolonged the shelf life of foodstuffs by a Trojan-horse strategy and reactive oxygen mechanism. Besides, antimicrobial activity ofZnO NPs allow improvement of the antioxidant activity of the packaging materials by limiting the presence of oxygen in the headspace. Comprehensive ZnO nanocomposite (NC) biopolymer (BP) packaging features and their significance for food packaging applications are presented in this talk. Furthermore, it discusses the effect of ZnO NPs on mechanical strength and barrier properties such as water vapor permeability, oxygen transmission rate, and UV transmission across the packaging material and in turn the shelf life of the food products.

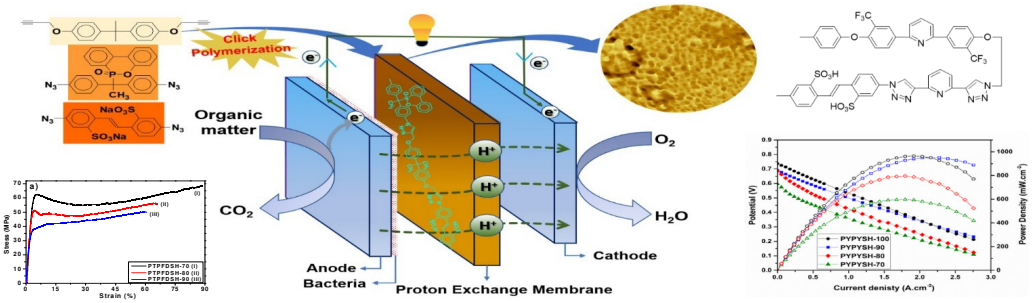
Phosphorus and Pyridinyl-Linked Sulfonated Polytriazoles: Membrane Fabrication for Fuel Cell Application

SUSANTA BANERJEE
Materials Science Centre,
Indian Institute of Technology Kharagpur,
Kharagpur 721302, India

Abstract

The Proton exchange membrane (PEM) is one of the significant elements of fuel cells. A PEM is a solid electrolyte used for proton transfer and stops fuel crossover between the cathode and anode. The semifluorinated sulfonated polytriazoles assimilate the benefits of both enhanced proton conductivity and chemical stability and make them one of the best choices for the construction of solid polyelectrolyte membranes for fuel cell applications. Several sulfonated polymers and membranes thereof were prepared over the years and their performances were examined as alternate PEM materials to tetrafluoroethylene-based sulfonated copolymers. The copper-induced azide-alkyne click polymerizations are a simplistic route to preparing sulfonated polytriazoles. Incorporating phosphine oxide moieties and pyridinyl units into polymer chains aids in creating a higher-quality polymer membrane with effective proton transport, high thermal and mechanical stability, and good water holding. Furthermore, the attendance of these moieties in polymers increases oxidative stability. Thus, phosphorus and pirdinyl-containing polymers are evolving as strong candidates for their application as polyelectrolyte membranes in fuel cells.

The group Prof. S. Banerjee is actively involved in the preparation of sulfonated polymers for PEM applications. The talk will provide an overview of the recent work carried out by his group with a particular emphasis on phosphorus and pyridinyl-containing polytriazoles and membranes thereof. Self-standing, transparent, and flexible membranes were fabricated from these polymers by a solution casting technique. The membranes were mechanically robust, thermally stable, and exhibited very high oxidative stability. It was possible to fabricate good quality electrode membrane assembly from the fabricated membranes, and single fuel-cell performance was investigated.



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III

Abstracts of
INVITED TALKS

MICROWAVE HYDROTHERMAL SYNTHESIS OF M-OX/M-SX COMPOSITES AND THEIR SUSTAINABLE ENERGY AND ENVIRONMENTAL APPLICATIONS

S. SRIKANTASWAMY

Ph.D. FRSC (London)
Professor and Coordinator
Centre for Materials Science and Technology (CMST)
University of Mysore, Vijanana Bhavan, Mansagangotti
Mysore – 5700 06

Abstract

The development of catalysts is crucial towards the optimal usage of renewable solar energy. This creates unparalleled potential for addressing rising concerns about energy and environmental sustainability. Metal oxides (M-Ox) and two-dimensional metal disulfides (2D M-Sx) have been the subject of intensive research, due to their exceptional catalytic characteristics. In this regard, catalysts have been synthesized using a facile, one-step microwave-assisted hydrothermal method. The synthesized catalysts were utilized in dye degradation, heavy metal degradation, biological activity, and photo/electrocatalytic hydrogen generation. In this study, catalysts synthesized by microwave hydrothermal method exhibits high specific surface area and conductivity, resulting in a suitable conductive network for the formation of M-Ox. The synthesized material are good Bio-compatible, Bio active catalyst and M-Sx is having quick charge transfer kinetics. Electrochemical analysis shows a low Tafel slope and a low onset potential in acidic environment. As-prepared nanocomposite showed higher photocatalytic activity. Apart from good catalytic activity, Long cycling stability along with an extremely high cathodic current density and a reduced over potential results in an excellent catalyst. The catalysts are active at temperatures ranging from 30 to 100°C and with a low activation energy, offering the possibility of practical, scalable processing of catalysts.

Key words: Photocatalysts, Photocatalytic dye degradation, photocatalytic hydrogen production, Microwave hydrothermal method.

ENHANCED DIELECTRIC, PIEZOELECTRIC AND FERROELECTRIC PROPERTIES OF BZT AND SBT CERAMICS AND THEIR THIN FILMS, LARGE AREA PULSED LASER DEPOSITION

A.R. JAMES

Ceramics & Composites Group,
Defence Metallurgical Research Laboratory
Hyderabad-500 058, Telangana, India
e-mail : james.dmrl@gov.in

Abstract

The application of simple intuitive and innovative steps to routine processing techniques can have a significant influence on the properties of materials. This paper describes an oxygen sintering process which when applied to two lead free piezoelectric ceramics, shows a profound enhancement in dielectric, piezoelectric and ferroelectric properties. The simple science behind the influence of oxygen on the properties of such materials is explained with the help of structure-property correlations in them. BaZr1-xTixO3 and SrBi4Ti4O15 ceramics with high density, obtained by sintering them using the oxygen assisted process were used as targets for growth of thin films, using Pulsed Laser Deposition (PLD). The latter part of the talk will describe the scaling up of a conventional PLD system, using both mechanical as well as optical components. The vacuum system is up-graded using a LASER scanning and rastering mechanism, whilst the optical system includes a LASER beam homogenizer, such a combination results in large area thin films of high quality.

DOWNCONVERSION LUMINESCENT PHOSPHORS FOR FUTURE GENERATION SOLAR CELLS

S. J. DHOBLE
Department of Physics, R.T.M. Nagpur University, Nagpur-440033, India
Corresponding author :sjdhoble@gmail.com

Abstract

With the advances in science and technology, solar cells (SCs) evolved from first generation solar cells to third generation solar cells with an appreciable enhancement in their efficiency. In search of novel anatomy and materials for solar cells, researchers have put tremendous efforts and ultimately fetched fruitful results. Different parts of the solar cell executions of mono and blended halide Perovskite SCs (PSC) became looked into. This illustrated that alloying halides can possibly enhance the solar cell executions of a PSC. A tuneable optical band gap is attainable by changing the structure of the blended halides, which prompts the extending of the spectrum range devoid of negotiating the solar cell executions of the PSCs. It has been exhibited that by conscientiously designing the film morphology and controlled handling, enhances the PCEs of the PSCs higher than 19 %. With the ceaseless execution of improved and reformed structures in the perovskite photovoltaic (PV), the solar efficiency has been enhanced up to 6 % through 12.3 % to 15.4 %. Be that as it may, much superior PCEs have been documented with other predominant designs of perovskite photovoltaic cells. Performance of PSCs can be determined by the crystallization, morphology and the grain size of the perovskites. Different methods are available and used in the world like solvent engineering, microwave annealing and solvent annealing to provide the soft perovskite surface and crystal growth. Prominently, from the outcomes, the temperature of the solar cell desires to surpass a basic temperature before it can produce power dramatically. Also, extremely high temperatures debase the open circuit voltage and consequently diminish the conversion efficiency of the solar cells and hence an issue to consider upon. Solar cells took more than a century to evolve and develop, even today it is in the path of improvement and it is an evergreen technology that proffers a way for the mankind and its future is going to be our future.

Keywords: Luminescence; perovskites; future generation solar cells; lamp phosphors; PCE.

MEDICINAL APPLICATION OF GREEN SYNTHESIS OF NANOPARTICLES FROM *MALUS DOMESTICA*, AS A POTENTIAL ANTI-MICROBIAL AGENT

SHILPA BOREHALLI MAYEGOWDA

CHRIST Deemed to be University, Bangalore Kengeri Campus, Kanmanike, Kumbalgodu, Mysore Road, Bangalore, Karnataka – 560074
Corresponding author: shilpa.borehalli@christuniversity.in ; shilpa.siddi@gmail.com

Abstract

The discipline of nanoscience becomes prominent at this point. In parallel antibiotic-resistant microorganisms are a growing concern for human health. Traditional antibiotics are rapidly losing their effectiveness against microbial pathogens that cause severe illnesses due to the increased antibiotic resistance by microorganisms. In recent years, nanoparticles (NPs) have become a household name in research technology, with their antimicrobial activity exhibiting enormous potential in the elimination of microbes. Silver nanoparticles (AgNPs) are known for their antimicrobial properties. Chemical synthesis of NPs, on the other hand, has several disadvantages, such as toxicity and other side effects. As a result, in this study use green synthesised AgNPs with apple juice extract used as active ingredient. Apples are enriched in flavonoids, which are great oxidising agents that can enhance the effect of the Ag in the NPs and aid in antimicrobial activity. In this experiment we aim to investigate the antimicrobial activity of the green synthesized nanoparticles on a variety of microbial cultures. On the other hand, AgNPs are known for their antioxidant properties relatively delay and prevent oxidative damage. We also test if the synthesized NPs can potentially inhibit the growth of microorganisms when adhered to fabrics that are used in manufacturing of masks.

Keywords: Antibiotic resistance, antibiotics, green synthesis, nanoparticles, AgNPs, antioxidant

EFFECT OF STRUCTURAL TRANSITIONS ON TYPE II MULTIFERROICITY IN $FEVO_4$

GOVERDHAN REDDY TURPU[1]*, G.BERA[1], V.R.REDDY[2], P.DAS[1], AND P. MAL[1]

[1]Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, C.G., India
[2]UGC DAE Consortium for Scientific Research, University Cmapus, Khandwa Road, Indore 452001, Madhya Pradesh, India

*Email: tg.reddy@ggu.ac.in

Abstract

A systematic and detailed study is carried out in the present work to study the structural, magnetic, ferroelectric properties and associated phenomena such as structural phase transitions, magneto-lattice coupling, magnetic frustration and magneto-electric coupling in polycrystalline $Fe_{1-x}M_xVO_4$ (M = Cr) compounds using suitable experimental techniques such as X-ray diffraction (XRD), Raman spectroscopy, temperature dependent synchrotron XRD, magnetization measurements, temperature and magnetic field dependent dielectric studies and ^{57}Fe Mössbauer spectroscopic studies, supported by detailed analysis. Structural studies on $Fe_{1-x}Cr_xVO_4$ ($0 \le x \le 1.0$) solid solutions by X–ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive Spectra (EDS) of X –rays, Raman and FT-IR spectroscopy, UV-Visible spectroscopy are given in detail. A structural phase diagram for $FeVO_4$-$CrVO_4$ solid solutions based on the experimental results is presented. A detailed note on the band gap variation in solid solutions and nature of d - d transitions are also presented here. A detailed account of magnetic transitions, magneto-lattice coupling and magnetic frustration in $Fe_{1-x}Cr_xVO_4$ (x = 0.0 - 1.0) studied by temperature dependent synchrotron XRD (SXRD), temperature and magnetic field dependent magnetization measurements is presented. SXRD data shows an intricate relationship between magnetic, ferroelectric and lattice degrees of freedom in this system. An exclusive magnetic Phase diagram and effective magnetic moment along with magnetic frustration were presented here. Detailed dielectric studies on polycrystalline $Fe_{1-x}Cr_xVO_4$

(x = 0.0, 0.10, 0.175 and 0.20) system investigating ferroelectricity (FE) and magneto-electric effect is presented. In dielectric permittivity ε a sharp peak at T_{N2} and a discontinuity evidenced in electromagnetic susceptibility indicates ferroelectrocity and magneto-electric effect at the polar to nonpolar transition regions. ^{57}Fe Mössbauer spectroscopic studies show finger print evidence for disappearance of non-equivalent sites of Fe as the structure changes from Triclinic – Monoclinic – Orthorhombic phases with the increasing Cr conent in $Fe_{1-x}Cr_xVO_4$. Temperature dependent ^{57}Fe Mössbauer spectroscopic studies show a signature of local lattice correlation with FE/spiral ordering and signatures of antiferromagnetic (AFM) transitions and field induced spin reorientation of Fe^{3+} are observed in A_{23} hyperfine parameters. Signatures of spiral magnetic order is observed for x=0.10 in spectral asymmetry and symmetry of line broadening at below and above of ordering temperatures.

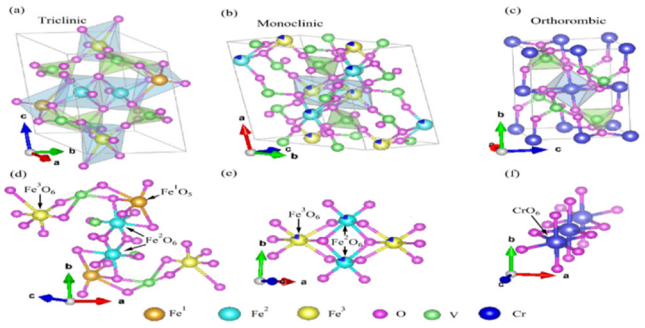

Figure: Crystal structure of (a) Triclinic $FeVO_4$, (b) Monoclinic $Fe_{0.825}Cr_{0.175}VO_4$, and (c) Orthorhombhic $CrVO_4$ and respective coordination changes for Fe/Cr ions in (d) Triclinic, (e) Monoclinic, and (f) Orthorhombic structures.

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IV

Abstract of
ORAL PRESENTATIONS

OMS : 1

LOW-COST SYNTHESIS OF MWCNT USING CVD METHOD AND THEIR ALIGNMENT IN POLYMER MATRIX TO ENHANCE THE MECHANICAL AND OPTICAL PROPERTIES OF OVERALL COMPOSITE.

MANU FAUJDAR[A], NUTAN SHARMA[B], SUBODH SRIVASTAVA[A] ATUL DADHICH[C]

[a]Department of Physics,Vivekananda Global University, Jaipur
[b]Department of Chemistry, Vivekananda Global University, Jaipur
[c]Department of Electrical Engineering, Vivekananda Institute of Technology, Jaipur
Corresponding Email: manu15faujdar@gmail.com

Abstract

MWCNTs have come to the forefront of nanomaterials and interest has grown exponentially in MWCNT/polymer matrix to enhance the mechanical and optical properties. MWCNT's have a very high aspect ratio, which makes them highly anisotropic; they can be aligned in polymers. TheMWCNT dispersed in polymer composite membranes have been preparedby Chemical Deposition Method (CVD). Composite membranes are characterized by Raman spectroscopy, optical microscopy, X-ray diffraction, electrical measurements and UV-Vis Spectroscopy.Optical microscopy and polarized Raman spectroscopy are used to confirm the CNT alignment. The alignment of CNTs gives rise to much improved electrical conductivity, elastic modulus and quasi-static fracture toughness compared to those with CNTs of random orientation. The optical behaviors of the MWCNT-Polymer matrix were performed by the UV-Vis Spectroscopy.

Keywords: Multi-Walled Carbon nanotubes, alignment, polymer matrix, electric field, magnetic field, Chemical Vapour Deposition

OMS2

DENDRITIC METAL COMPLEXES OF NI(II), FE(II), MN(II) AND CO(II) : EFFECTIVE ANTIBACTERIAL SCREENING

CHANDANA B. ROY[A], VIKAS V. GITE[a*], JYOTSNA S. MESHRAM[A*]
[a]School of Chemical Science, North Maharashtra University, Jalgaon-425 001 Maharashtra, INDIA
[d]Department of Chemistry, Rashtrasant Tukadoji Maharaj Nagpur Univrsity, Nagpur-440 022 Maharashtra, INDIA
drjsmeshram@gmail.com

Abstract

The present investigation is reporting synthesis of (N'E,N'''E,N''''E,N''''''E)-3,3',3",3"'-(ethane-1,2-diylbis(azanetriyle))tetrakis(N'-(2 Yydroxybenzyllidene)propanehydrazide) macromolecular dendritic scaffold (D) as a host molecule for d-block transition series element of Ni(II), Mn(II), Co(II), and Fe(II) binding with coordinate bonds. The structural confirmation of dendrimer and dendritic metal complexes (DMC) are well supported with FTIR and LC-MS spectroscopies. Thermal properties are studied using thermo gravimetric analysis. Osiris and molinspiration calculations are done together for dendrimer and dendritic metal complexes. A new class of antibacterial dendrimer and dendritic metal complexes are reported with their tuneable activity against selected strain of gram-positive and gram-negative bacteria.

Key Words: Macromolecule; Dendritic metal complex; Antimicrobial screening

OMS-3

COST EFFECTIVE, ECO-FRIENDLY FABRICATION OF COPPER OXIDE NANOPARTICLES FROM FRUIT PART OF *SYZYGIUM ALTERNIFOLIUM* (WT.) WALP., CHARACTERIZATION AND EVALUATION OF ITS SYNERGISTIC BIOLOGICAL ACTIVITIES

PULICHERLA YUGANDHAR* AND NATARU SAVITHRAMMA
Dept. of Botany,
Sri Venkateswara University,
Tirupati-517502, Andhra Pradesh, India.
*Corresponding author: Email: yugandharbotany@gmail.com
Ph: 09618434539

Abstract

The present study reported a cost effective and eco-friendly method for fabrication of copper oxide nanoparticles from fruit part of *Syzygium alternifolium*. These are characterized by using different spectroscopic and microscopic tools such as, UV-Vis Spectrophotometer, FT-IR, DLS&ZETA, XRD, AFM, SEM and TEM. The antimicrobial and anticancer activities of nanoparticles were carried out on different microorganisms and MDA-MB-231 breast cancer cell lines, respectively. Overall, the nanoparticles were in spherical shape and represent size below to 100 nm. These nanoparticles exhibited synergistic antimicrobial and anticancer activities. Due to cost efficiency, these formulations were recommended for pharmaceutical industries to develop novel medications.

Keywords: *Syzygium alternifolium*, Copper oxide nanoparticles, Characterization, Antimicrobial activity, Anticancer activity.

OMS-4

THE DIELECTRIC PROPERTIES OF PMMA/CDO NANOCOMPOSITE FILM

ANITA RAJKUMAR GHANDHE[a]* AND BASAVARAJA SANNAKKI[b]
[a]*Department of Soil Science & Agriculture Chemistry, University of Horticultural Science, Bagalkot-587 104*
[b]*Department of Post Graduate Studies and Research in Physics,Gulbarga University, Gulbarga- 585 106, Karnataka.India*

Abstract

The Frequency dependence of dielectric constant ε' and dielectric loss ε" of PMMA with composite of CdO polymer film are studied in the frequency range 50 Hz- 5 MHz The experimental results show the PMMA with composite with CdO polymer films the dielectric constant increases with increased the temperature as well as frequency, and is due to greater freedom of movement of the dipole molecular chains within the polymer film at high frequency. The dielectric loss of PMMA and composite film of CdO polymer film ferquency increases dielectric loss decreases, which indicates that the major contribution to the polarization comes from orientation polarization. And the a.c. conductivity of PMMA film its composite CdOpolymer film shows that increases the temperature and frequency the a.c. conductivity increases anomaly at lower temperatures becomes more obvious with increasing the frequency and in composite film the CdOdoping content, which probably corresponds to a basis electrode polarization effect. The film is characterized by using X-Ray diffractometer and to measured lattice parameter of PMMA with nanocomposite of CdOpolymer film it has a cubic crystal structure of CdO.

Keywords: *XRD, FTIR, SEM, Dielectric permittivity, A.C. Conductivity;*

OMS-5

ALGAE BIOMASS AS ALTERNATIVES TO WOOD PULP IN HANDMADE PAPER TECHNOLOGY – A MEANS OF ALTERNATIVE LIVELIHOOD GENERATION FOR RURAL WOMEN

PIYALI MUKHERJEE
DST Woman Scientist B, Department of Biotechnology, The University of Burdwan, Golapbag more, Burdwan-713104, W.B., India
(piyalimkhrj8@gmail.com)
Prof. Jai Prakash Keshri, Department of Botany, The University of Burdwan, Golapbag more, Burdwan-713104, W.B., India

Abstract

Anticipated shortages of raw materials for paper industry have forged the entry of algae as alternatives to wood-pulp. Five algal species: *Pithophora* sp., *Lyngbya* sp., *Hydrodictyon* sp., *Cladophora* sp. and *Rhizoclonium* sp. werecollected from different parts of Burdwan-town, West-Bengal, India. Their biomass compositional values were determined with respect to *Eucalyptus* wood-pulp. Paper characteristics were studied in terms of Breaking-length, tensile-strength, CI-index, pH, brightness, recyclability and durability. *Hydrodictyon* sp., besides *Rhizoclonium* sp. and *Cladophora* sp. were established as the most suitable candidates for paper-pulp formulation in terms of high cellulose, hemicellulosescontents and low lignin and silica contents.

Keywords—Algae, Biomass, Paper, Pulp, Wood

OMS-6

OPTIMISTIC SYNTHESIS OF LOW COST CARBON NANOTUBES USING INDIGENOUSLY DEVELOPED CHEMICAL VEPOR DEPOSITION (CVD) SETUP AND CHARACTERIZATION OF THEIR PHYSICOCHEMICAL PROPERTIES

SUBODH SRIVASTAV[a,*], SHUBHRA MATHUR[b], ATUL DADHICH[c], VIKRAM SINGH YADAV[a], ANUJ VIJAY[d]

[a]Department of Physics, Vivekananda Global University, Jaipur 303012, India

[b]Department of Physics, Compucom Institute of Technology & Management, Jaipur 303906, India

[c]Department of Electrical Engineering, Vivekananda Global University, Jaipur 303012, India

[d]Department of Physics, GLA University, Uttar Pradesh 281406, India

subodhphy@gmail.com (Subodh Srivastava)

Abstract

A lot of research has been done on CNTs in the past few decades, still a cost-effective technique for the production of the CNTs at a large scale is lacking. The main reason for this problem is the lack of understanding of the CNTs growth mechanism. Chemical vapor deposition (CVD) is the most favored synthesis technique for mass synthesis of CNT but the main problem in the large-scale production of the CNTs via CVD techniques is that, with the increase in the yield, the purity of the product is decreases and leads to the increase in cost. The aim of the current studies is the development of a indigenous Chemical Vepor Deposition synthesis setup and to optimize the synthesis conditions (i.e. hydrocarbon and catalyst type, concentration of catalyst, growth temperature, vapor pressure, gas-flow rate, catalyst support, and reactor geometry.) for mass synthesis of CNTs in a controlled way at low cost. The synthesized CNT product was characterized using scanning electron microscopy (SEM), X-ray diffraction (XRD), and Raman spectroscopy. The SEM images clearly exhibits the agglomerated tube like structures in synthesized product. The powder XRD revealed the presence of the hexagonal crystallographic phase. Furthermore, the presence of the G and 2D bands reveals sp^2 hybridization and confirms the presence of

carbon nanotubes in samples. In conclusion, carbon nanotubes synthesized via the CVD system is of high quality and quantity.

Keywords: Chemical Vapor Deposition (CVD); Carbon Nanotubes (MWCNT); X-ray diffraction (XRD); Scanning Electron Microscopy (SEM); Raman spectroscopy.

OMS-7

HUMIDITY SENSING OF PANI/GO COMPOSITE AT DIFFERENT FREQUENCY RANGES

DIVYANSHI SRIVASTAVA AND R.K. SHUKLA*
Department of Physics, University of Lucknow,
Lucknow, 226007, U.P, India
*Email Id: rajeshkumarshukla_100@yahoo.co.in, dibyanshi2@gmail.com

Abstract

In this work, impedance variations have been measured under various humidity conditions at frequency ranges b/w 100 Hz to 5 MHz. Various mass ratios of GO in PAni were prepared by electrochemical polymerization process. The film of the samples was prepared by deposition on ITO glass slide using electrochemical deposition method. Samples were analyzed for humidity sensing in the range of 20 to 90 RH%. It is demonstrated that impedance value decreases with increase humidity. Moreover, here humidity sensor shows a fast response and recovery time. Therefore, GO appears to be a consummate material for building a humidity sensor with high sensing for extensive approach.

Keywords: Sensor; Nanocomposite; XRD; FESEM

OMS-8

SYNTHESIS, CHARACTERIZATION, PHOTOCATALYSIS AND PHOTOLUMINESCENCE OF BaWO4 AND rGO - BaWO4 COMPOSITE NANOPARTICLES: A COMPARIAIVE STUDY"

CH.SRIDHAR1, NEHA2, G.R. TURPU2, SHALINTA TIGGA2, M.KALPANA3 AND G.PADMAJA1,*
1Department of Physics, Kakatiya University,
Warangal, Telangana, India
2Department of Pure and Applied Physics,
Guru GhasidasVishwavidyalaya,
Koni, Bilaspur 495009, C.G. India
3K.U College of Engineering & Tehnology,
Kakatiya University, Warangal
*Corresponding author: gpadmaja06@yahoo.com

Abstract

BaWO4 (BWO), reduced graphene oxide (rGO) and rGO-BaWO4 (rGO-BWO) nanocomposites were synthesized through co-precipitation method, modified Hummer's method and ultrasonication method respectively. XRD studies confirm the single-phase synthesis of BWO and its rGO nanocomposites through signature peaks. Raman spectroscopy confirms the better physical attachment between rGO and BWO NP's. The diffraction peak at 2θ = 24.4° corresponds to the (002) reflection plane of reduced phase of rGO. FTIR studies show strong W–O stretching in [WO4]2- tetrahedrons at 667-817cm-1. SEM images confirm the nanocomposites formation through uniform distribution of nano particles of BWO samples on the reduced graphene oxide layers. UV-Vis DRS technique for band gap calculations reveal that the band gap energy increases with increase in calcination temperature and band gap energy is of the order of 3.25eV - 4.25eV for BWO and it is of the order of 2.782 eV - 3eV for rGO−BWO composite. The photocatalytic activity of rGO−BWO composite evaluated by photocatalytic degradation of Methylene Blue (MB) dye under visible light irradiation shows improved ability for rGo-composite as compared to the parent compound BWO. The PL intensity of the BWO and rGO-BWO composites show indicative blue emission and its dependence on the particle size controlled through annealing temperature. Two emission peaks in BWO samples suggests the presence of two types of centers in BWO lattice. The excitation spectra exhibit one broad peak centered around 345 nm.

OMS-9

STUDY OF STRUCTURAL AND MAGNETIC PROPERTIES OF CADMIUM SUBSTITUTED NICKEL FERRITES BY CO-PRECIPITATION METHOD

SURESHKUMAR R. CHOUBEY[1]AND LAXMIKANT P. DAMODARE[2]

[1]Department of Physics,
VMV Commerce, JMT Arts and JJP Science College,
Wardhaman Nagar, Nagpur 440008, India
[1]Corresponding Author, Email: sureshkumar.choubey@gmail.com
[2]Department of Physics, Hislop College, Temple Road,
Civil Lines, Nagpur 440001, India

Abstract

Polycrystalline $Cd_{0.5}Zn_{0.5}Fe_{1.94}Ni_{0.1}O_4$ ferriteswith x have been prepared by conventional ceramicroute. Calcination and sinter ing of samples were performed at 800 ^{o}C for 4 hours, respectively. The prepared samples were characterized by powderX-ray diffraction. The observed modificationsin structure and increase in lattice constant are attributed to the difference in ionic radius of substituted Cd^{2+} ion and displaced Ni^{2+} ion. The room temperature specific saturation magnetization and Curie temperature are observed to decrease continuously with decrease in cadmium content and are attributed to the decline of A–B exchange interaction. The monotonic increase in initial permeability and decrease in magnetic loss are observed with cadmium concentration.

Keywords: Spinel Ferrites; Co-precipitation; XRD; SEM; VSM.

OMS-10

EFFECT OF EUROPIUM ON PHOTOLUMINESCENCE PROPERTIES OF $SRLA_2O_4$ ELECTROSPUN NANOFIBERS

MRUNAL GANDOLE[#], MAHELAQUA HAQUE, SUBHASH B. KONDAWAR*
Department of Physics,
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur-440033, Maharashtra, India
[#]Presenting author email: mrunalgandole1234@gmail.com
*Corresponding author email: sbkondawar@yahoo.co.in

Abstract

Europium doped $SrLa_2O_4$ nanofibers were prepared by novel electrospinning method. The $SrLa_2O_4:Eu^{3+}$ nanofibers were characterized by X-ray diffraction, Scanning electron microscopy and Photoluminescence. Average diameter of $SrLa_2O_4:Eu^{3+}$ nanofibers was found in range 162-206 nm. Photoluminescence study revealed that bright red emission at 628 nm owing to the transition $^5D_0 \rightarrow ^7F_2$ was observed. The chromaticity co-ordinates show enhanced red-light emission of $SrLa_2O_4:Eu^{3+}$ nanofibers. The doping concentration of 10 mol% of Eu^{3+} is shown to be optimum for red light emission. Owing to its high color purity and good emission intensity, $SrLa_2O_4:Eu^{3+}$ nanofibers can be used in various light emitting applications.

Keywords: Electrospun nanofibers; Photoluminescence; Europium; $SrLa_2O_4$.

OMS-11

SYNTHESIS, PIEZOELECTRIC AND DIELECTRIC CHARACTERIZATION OF EU2O3 SUBSTITUTED BNBT6 FOR DEVICE APPLICATION

D GANGADHARUDU[1], V SRINIVASA RAO[2], B VENKATESWARA RAO[3]

1 *Lecturer in Physics,*
SRVBSJB Maha Ranee College,
Peddapuram,Andhra Pradesh, India
2 *Principal, Government Degree College,*
Rampachodavaram, Andhra Pradesh, India
3 *Lecturer in Physics, S S & N College,*
Narasaraopet, Andhra Pradesh, India
E-mail:*dhard98@gmail.com, drrao.vanukuru@gmail.com* &
venkateswararaob2000@gmail.com

Abstract

Dielectric response, impedance, modulus, dc and ac conductivity of polycrystalline ceramic, $Pb_{0.65}Na_{0.075}Bi_{0.075}K_{0.4}Nb_2O_6$ (PNBKN) at different temperatures (350 C -6000 C) and frequencies (45Hz -5MHz) has been carried out. PNBKN prepared by solid state reaction technique, the results of X-ray diffraction confirmed the partial substitution of Sodium and Bismuth at A-site, in TB type structure lead potassium niobate (Pb(1-X) K2xNb2O6, PKN, X=0.2) doesn't distort its structure, but phase transition temperature found to be decreased to 3250C compared to PKN. The dielectric analysis reveals the presence of electrode polarization, free charge motion at low frequencies which are related to space charge polarization and conductivity relaxation respectively. Complex impedance plots (Cole –Cole plots) showed a non –Debye type relaxation. These are resolved into three semicircles, indicating the bulk, grain boundary and interfacial polarization effects. Modulus studies confirm the electrode and /or ionic polarization effect by hopping and localized motion of ions. Ac conductivity has been found to be frequency dependent at high frequency and low temperatures such as σ = σdc + AωS, and shows frequency independent at low frequencies and high temperatures. DC and AC conductivity activation energies were estimated on the material and the results are discussed.

Keywords: Ceramic; Dielectric; Impedance; Electric Modulus; Conductivity.

OMS-12

DEVELOPMENT OF HIERARCHICAL NANOSTRUCTURED $CUBI_2O_4$FOR ELECTROCHEMICAL DETERMINATION OF CATECHOL FROM THE ENVIRONMENT.

A.ARUMUGAM[1] AND PR.KALEESWARRAN

1. Professor, Department of Botany, Alagappa University, Karaikudi, Tamil Nadu India PIN code- 63000
2. P. Kalieswaran, Deparetment of Nanoscience and Technology, Alagappa University, Karaikudi, Tamil Nadu India PIN code- 63000

Corresponding other, arumugama@alagappauniversityac.in, sixmuga@yahoo.com

Abstract

Catechol (CT) is one of the essential ortho-isomer of benzenediols derivatives, broadly utilized as the primary chemical material for several chemical industries. As reported in previous studies, CT has also used extensively to manufacture textiles, rubber, pharmaceuticals, cosmetics, etc. However, CT has been reviewed as a periodical environment contaminant and Group 2B human cancer-causing agent because of its less degradability in water. It makes threats to human well-being and all other living organisms in the natural condition even at lower concentrations. On a day-by-day basis, people who exposure to CT can result in multiple health problems, viz rise in blood pressure, damage to the kidney, liver, lungs, DNA, and central nervous system. CT has perceived as one of the most basic contaminations by the European Union and the US Environmental Protection Agency [5]. Thus, considerable concentration has to be covered towards CT fabrication even at the lower level in the environmental samples. Numerous analytical methods have been established for the determination of CT, which includes high-performance liquid chromatography, gas chromatography, flow-injection analysis, chemiluminescence, and electrochemical techniques. Among the methods mentioned above, the electrochemical techniques are the most prominent because of their cost-adequacy, easy handling, and facile approach for the impulsive monitoring of environmental pollutants.

The electrochemical performance of the sensor strongly depended on the electrocatalyst of electrodes. The combination of distinctive nanostructured transition metal oxides (TMOs) and post-transition metal oxides (PMOs) have driven significant interest due to their versatile applications such as antibacterial, drug delivery, sensing, and environmental remediation. The spinel phase mixed metal oxide AB_2O_4 has attracted growing attention employing its chemical composition. The cationic sharing of A and B cations valency can change the oxidation states, which are substantive influence elements on the physical and chemical properties of the spinel metal oxides [21–24]. Amongst the spinel, structured metal oxides, p-type semiconductor copper bismuthate ($CuBi_2O_4$) has been conventionally used in various fields due to its exceptional characteristic features such as narrow bandgap, appropriate band positions, and low cost. Primarily, it comprises earth-abundant Cu, Bi, and O elements that are less toxic. In $CuBi_2O_4$ (CBO), the divalent AII Cu ions (Cu+) of the tetrahedral sites, where the trivalent BIII Bi ions (Bi+) cations occupy the one half (1/2) of the octahedral sites, whereas it is arranged with CuO4 square planar groups are associated to distorted trigonal BiO_6 polyhedral, which is one of the essential factors of spinel structured compounds. However, CBO delivers a weak charge carrier mobility, and multiple experiments have been made to improve. By controlling the morphology, hybridizing with immensely conductive materials improves electrical and electrochemical performance On the other hand, the latest reports show that the use of two-dimensional carbonaceous materials in electrochemical sensors is growing universality, particularly with high electrical conductivity, outstanding flexibility, and high specific surface area [31, 32]. Out of all other 83 carbonaceous materials, graphene (GR) has captivated much consideration in biosensing transducer due to its simple biofunctionalization properties, numerous proportions of active sites 85 and π-π conjugated arrangement of GR deliver electron movement smoothly through the GR [33–38]. The amalgamation of GR with CBO can yield the synergetic effects of two components, and it can influence the redox reaction with a rapid electron transfer rate, showing the enriched performance. To the best of our knowledge, the CBO/GR composite modified electrode has not yet been used for electrochemical determination of CT, to the best of our knowledge. This research study

aims to synthesize CBO/GR nanocomposite by a single-step hydrothermal process for the first time.

The CBO/GR nanocomposite modified (GCE) has exhibited a trace-level detection limit, wide linear range, appealing sensitivity, quick response, excellent selectivity, and robust reproducibility. The proposed CBO/GR composite modified GCE has tremendous potential for determining the CT residue in various water samples. It also shows the higher electrochemical performance against CT compared to the modified electrodes mentioned earlierIn summary, the CBO/GR nanocomposite have been successfully prepared and characterized by different analytical techniques, such as XRD, FESEM, Raman spectroscopy, EDX, TEM, and XPS spectroscopyand applied as electrochemical sensor for the determination of CT. The CBO/GR nanocomposite showed a good performance toward CT due to the synergetic effect, 326 abundant active sites, high electronic conductivity, large specific surface, and superior catalytic activity. The fabricated CT sensor demonstrated a wide linear range of 0.0017–337 μM with a low LOD of 0.4 nM. Moreover, the proposed sensor showed good selectivity, stability, and satisfactory recoveries for the detection of CT. Antibacterial activity of synthesised CBO and SCBO against *E. coli* was improved. CBO and CBO/GR toxicity against A. salina were also negative. Overall, the findings suggest that CBO, CBO/GR, could be promising antibacterial, non-toxic,

Keywords: Nanocomposite; electrochemical sensor; Catechol (CT); Drug delivery; Sensing and Environmental remediation.

OMS-13

STUDY OF PHOTOLUMINESCENCE PROPERTIES OF DY^{3+} DOPED $NA_2SR_2MG(BO_3)_2F_2$ PHOSPHORS FOR WLED APPLICATION

AMRUTA GAIKWAD[1*], YATISH R. PARAUHA[1], K. V. DABRE[2], S. J. DHOBLE[1]

[1]Department of Physics, R.T.M. Nagpur University, Nagpur – 440033, India

[2]Department of Physics, Taywade College, Mahadula-Koradi, Nagpur – 441111, India

*Corresponding author: amrutagayakwad19@gmail.com

Abstract

Borate fluoride based luminescent materials are currently of interest due to their rich structural chemistry and the diverse applications as catalysts, ion exchanges and nonlinear optical (NLO) materials. Borate crystals are commonly used to produce high-power UV light due to their relatively high resistance against laser-induced damage. The addition of fluorine (F) into the borate crystals is recognized to be an effective approach in designing novel non centrosymmetric crystals. In order to broaden the gap between the bands of the borate, the inclusion of F- ions in the lattices has been developed to obtain high transparency in the UV region. Rare earth activated Borate Fluoride phosphors with excellent physical and chemical properties are highly applicable for WLEDs. In this work, we have synthesized a novel series of Dy^{3+} doped $Na_2Sr_2Mg(BO_3)_2F_2$ (x = 0.5 – 3 mol%) phosphors via high temperature solid state reaction. The crystal structure, photoluminescence properties and CIE coordinates of the synthesized Dy^{3+} doped $Na_2Sr_2Mg(BO_3)_2F_2$ were investigated in detailed. The PL excitation spectrum of $Na_2Sr_2Mg(BO_3)_2F_2$:Dy^{3+} phosphor get excited at 580 nm and intense peaks were observed at 350 nm, 365 nm, 388 nm, 428 nm, 448 nm and 456 nm between 300-500 nm due to f-f transitions of Dy^{3+} ions attributed to $^6H_{15/2}\rightarrow{}^6P_{7/2}$, $^6H_{15/2}\rightarrow{}^6P_{5/2}$, $^6H_{15/2}\rightarrow{}^4F_{7/2}$, $^6H_{15/2}\rightarrow{}^4G_{11/2}$ and $^6H_{15/2}\rightarrow{}^4I_{15/2}$ transitions, respectively. The emission spectrum exhibited two intense peaks at 482 nm and 580 nm under different excitation 350 nm, 365 nm and 388 nm. The yellow emitting peak i.e., 580 nm peak is divided into two peaks 572 nm and 580 nm. The emission intensity of blue emitting peak (482 nm) is high as compared to the yellow emitting peak (580 nm). The emission intensity increases as concentrations of Dy3+ ions increase. The CIE color coordinates, color purity and Correlated color temperature were calculated as (0.2748, 0.3452), 88.60% and 8447 K, respectively. The

CIE color coordinates were observed in white region thus it emits white light at different excitation wavelength due to combination of blue and yellow emission. From these results it is concluded that $Na_2Sr_2Mg(BO_3)_2F_2:Dy^{3+}$ phosphors can be used in the fabrication of WLEDs as a single phase phosphor.

Keywords: Borate Fluoride; solid state reaction; photoluminescence; WLEDs; phosphor

OMS-14

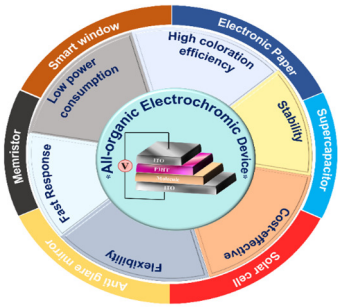
CONTROLLING THE FLOW OF LIGHT THROUGH AN "ALL-ORGANIC" APPROACH: LARGE-AREA, FLEXIBLE, POWER-EFFICIENT POLYELECTROCHROMIC EVENTS

PRAKASH CHANDRA MONDAL*
Department of Chemistry, Indian Institute of Technology Kanpur, Uttar Pradesh-208016, India *Email: pcmondal@iitk.ac.in

Abstract

The present era has seen tremendous demands for electrochromic materials for visible-region multicolor display technology, paper-based electronic devices, smart windows, and optoelectronic applications. Towards this goal, we report large-scale polyelectrochromic devices fabricated on rigid to flexible ITO substrates comprising novel viologen, (1,1'-bis(anthracen-9-ylmethyl)-[4,4'-bipyridine]-1,1'-diium bromide, AnV^{2+}), and polythiophene (P3HT). Interestingly, the devices show three states of reversible color in response to the applied bias, sub-second switching time (0.7 s/1.6 s), and large coloration efficiency (484 cm^2/C), longer cycling stability up to 3000 s (10^3 switching cycles). The devices are fully characterized, and electrochromic performances are ensured by bias-dependent UV-vis spectroscopy. Interestingly, fabricated electrochromic devices can be run by a low-cost commercial Duracell (1.5 US$ for 10 cells of 1 V). The computational study facilitates the understanding of experimental results along with AC-based electrical study and equivalent circuit modeling. Our work shows CMOS compatibility and one of the best-performing devices that could pave the way for developing cost-effective flexible, and wearable electrochromic devices.

Keywords: viologen, P3HT, reversible redox change, optical information, flexible electrochromic device



OMS-15

DETERMINATION OF QUALITY OF MADE TEA USING ZnO NANOROD SENSINGELEMENTS

SUMAN CHATTERJEE

Department of Physics,
University of North Bengal,
Siliguri-734013, India
suman@nbu.ac.in

Abstract

Detection of Volatile organic components are important for identification offlavor in different commercial organic products like Tea, Coffee, Wine, etc. The flavor components are detected through porous nano-structured ZincOxide (ZnO) sensing elements. This work shows the potential application ofnano-structured gas sensor arrays for monitoring the quality of Indian tea. In this paper, ZnO nano-particles were fabricated on a glass substrate by sol-geltechnique. The ZnO film possessed a columnar structure consisting of smallcrystals with an average grain size of around 5 nm. The sensing properties ofthe ZnO film were tested for two different Tea liquors, namely, Assam CTCTea and Darjeeling Orthodox Tea. Though the main ingredients in made tea aresame, the quality of made tea mainly differ from their flavor types, which relyon their trace components. Flavor type of tea liquors is a very important factorin identification of quality of Indian tea. An obvious change in resistance of theZnO film was also observed when the sensor was exposed to gas mixture. Thenano-structured elements showed higher degree of selectivity than the largersized grains and pores. The sensing mechanism of the nano-structured ZnOsensor is also discussed.

Keywords: Zinc Oxide, nanorod, sensor, tea aroma.

OMS-16

DEVELOPMENT OF NOVEL FLAME RETARDANT WATERBORNE POLYURETHANES UTILISING PHOSPHOROUS BASED POLYESTER POLYOL

PARTH M. KAPATEL

Department of Materials Science,
Sardar Patel University
parth91kapatel@gmail.com

Abstract

In the present work attempts have been made to synthesize waterborne polyurethanes (WBPUs) by the green approach in terms of utilizing water as a solvent medium. It has been found extensively useful in the field of coating applications. These fields require a prominent flame retardancy of the materials. Hence, flame retardancy has been improved in present work by incorporating phosphorous moiety in the polymeric chain in a reactive way. By the use of prepolymer mixing method and varying NCO:OH mole ratio, various flame retardant waterborne polyurethanes were synthesized.

Keywords: Waterborne; Polyurethanes; Coatings; Prepolymer mixing; Flame retardancy

OMS-17

ROLE OF NANO CRYSTALLINE SPINAL FERRITE MATERIAL IN THE COMMUNICATION AND INFORMATION TECHNOLOGY.

TAMBOLI ARIF, SAIMA G SAYYED AND DR. A. K. WALUNJ

Poona College of Arts, Science and Commerce, Camp Pune 4110011
tambolipoona@gmail.com

Abstract

Herein, the magnetic properties such as Saturation magnetization [Ms(emu/gm)], Magnetic moment [Mr(emu/gm)], Coercivity [Hc(Oe)], are reported for the series [Cux Co(constant) Ni0.8-x Fe2O4] where constant=0.2 with x=0.2, 0.4 and 0.6 of nanocrystalline spinel ferrites, synthesized by Sol-Gel auto-combustion technique. High purity metal nitrates are used for synthesis and citric acid as a catalyst. The variation in the Saturation magnetization [Ms(emu/gm)], Magnetic moment [Mr(emu/gm)], Coercivity [Hc(Oe)] are studied at room temperature due to the effect of substitution of Cu2+ density 'x' in [(Ni0.8-xCux Co(constant))Fe2O4]. The nanocrystalline spinal Structural of ferrite material is confirm Fourier Transform Infrared Spectroscope (FT-IR). The magnetic properties are studied by using Vibrating Sample Magnetometer (VSM). The variations in the magnetic properties of the prepared ferrite material are discussed.

Keywords: Sol-gel auto-combustion, FT-IR, VSM.

OMS-18

STATISTICAL PREDICTION OF THE AMOUNT OF CMC AND WATER REQUIRED TO ADJUST THE PARAMETERS OF BROWN GLAZE

SOUJATYA SARKAR, SUDIP KUMAR DAS

University of Calcutta
soujatya.sarkar2001@gmail.com

Abstract

Ceramic glaze is an impermeable layer or coating of a vitreous substance which has been fused to a whiteware or ceramic-ware vessel by firing. The glaze is mainly used to colour, decorate and waterproof an item. We have carried out a study using the commercial Brown Silica Glaze provided for experimentation purposes by Aditya Birla Insulators, Ltd. The present study will mainly focus on the prediction of a scale of addition of the additives (only the binder, i.e., carboxy-methyl-cellulose and water) to adjust the parameters of the glaze to the production standards, and thus will also improve the quality of Brown Silica Glaze by discontinuing the use of harmful additives, like, Calcium Chloride (20% solution) and Sodium Hexametaphosphate. The prediction algorithm is built universally for all glazes, i.e., it can be used to predict the amount of binder (carboxy-methyl-cellulose) and water that is required to be added to the glaze according to any company's production standards. Glaze samples were prepared by adding different amounts of additives with virgin glazes in different containers. Their parametric readings (parameters: density and fluidity) were noted along with the amount of the additives added.

Then, we statistically analysed the collected data using matplotlib and Python to understand the trendline of the change in the parameters of the sample with the addition of the additives. After statistically analysing the data, we found that the trendlines for both carboxy-methyl-cellulose and water against the densities and fluidities of the glaze samples are linear fit models. Hence, we used Scikit Learn and Python to create a prediction model based on Linear Regression, which will use the required values of difference in density and the required final fluidity to predict the amount of the additives to be added to the virgin glaze, to obtain the desired production standards for the glaze accurately.

Keywords: Glaze; Data Analysis; Prediction; Additive; Clay-ware

OMS-19

HOLLOW POLYPYRROLE NANOSPHERES/ N DOPED GRAPHENE COMPOSITE AS A EFFICIENT ELECTRODE MATERIAL FOR SUPERCAPACITOR

RINI JAIN, SATYENDRA MISHRA

SSES Amravatis Science College Pauni
University Institute of Chemical Technology,
North Maharashtra University, Jalgaon
rinijain9@gmail.com

Abstract

A hollow Polypyrrole (PPy) nanospheres and Nitrogen doped graphene (NG) composites have been prepared. In this process, NG sheets were synthesized by hydrothermal method. Then, hollow PPy nanospheres were obtained on the surface of NG sheets by in situ chemical oxidative polymerization. The PPy/BG composite has been characterized by Field Emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), Raman spectra and Fourier transform infrared spectra (FTIR). Different electrochemical methods including cyclic voltammetry (CV), Galvanostatic charge–discharge (GCD), and electrochemical impedance spectroscopy (EIS) have been applied to study the electrochemical properties. The specific capacitance of PPy/NG composite based on the three-electrode system is as high as 500 F g−1 at a current density of 1 A g−1 and enhanced stability about 85% after 1200 cycles, indicating that the composite has an impressive capacitance and excellent cycling performance

Keywords : Polypyrrole nanospheres, Nitrogen doped graphene, Supercapacitors, Nanocomposite

OMS-20

ULTRASONIC INVESTIGATION OF MOLECULAR INTERACTIONS OF IN AQUEOUS POLYACRYLAMIDE (PAA) SOLUTION

SUGANDHA V. KHANGAR, O.P.CHIMANKAR, Y.S. TAMGADGE, R. Y. BAKALE

Assistant Professor (Physics), Department of Physics, Shivaji Science College, Congress Nagar, Nagpur
Professor and Head (Physics), PG department of Physics, RTM Nagpur University, Nagpur
Assistant Professor (Physics), Department of Physics, Mahatma Fule Arts, Commerce & Sitaramji Chaudhari Science Mahvidyalaya, Warud (SGBAU), Amravati
Assistant Professor (Physics), Department of Physics, Mahatma Fule Arts, Commerce & Sitaramji Chaudhari Science Mahvidyalaya, Warud (SGBAU), Amravati

Abstract

The ultrasonic technique provides an effective and reliable tool to investigate properties of polymer solutions in the light of phase separation studies. Acoustical studies in polymer solutions and in solid polymers have been the subject of research in recent years. In order to perform the polymerization process, it is necessary to measure viscosity. In case of highly viscous fluid, viscosity starts to be dependent on the vibrational and rotational frequency of the sensing element. The propagation of ultrasonic waves and the measurement of their velocity, density and viscosity in solution form an important tool for the evaluation of various acoustical and thermo-dynamical parameters which gives an insight into the nature of miscibility/compatibility and molecular interactions in polymer solution. The phenomenon polymer-solvent miscibility may arise due to any specific molecular interactions such as hydrogen bonding, dipole- dipole interactions and charge transfer complexes for homogeneous polymer- solvent mixture. Miscibility is an important phenomenon in polymer solution to achieve mechanical integrity, better adhesion and better processing. In ultrasonic pulse-echo technique, polymers like PAA (Polyacrylamide) is often used for flocculate formation in waste water treatment. In present research work we have chosen polyacrylamide solution as a highly viscous fluid

and present a method for measuring ultrasonic and acoustic parameters such as ultrasonic velocity, density and viscosity and other related acoustic parameters in the temperature range 288 K to 308 K at 5MHz ultrasonic frequency.

Keywords : Polyacrylamide, Viscosity, acoustic parameters, pulse echo technique.

OMS-21

LITHIUM-ION BATTERY THERMAL MANAGEMENT SYSTEM USING THERMOELECTRIC MODULE AND MICROCONTROLLER.

SUNIL MAGAN MORE, ANIKET RAVINDRA DUSANE AND TUSHAR TANAJI JADHAV

Sri Satya Sai University of Technology & Medical Sciences, Sehore, MP
Guru Gobind Singh College of Engineering and Research Centre
sunilmmore2009@gmail.com

Abstract

Electric vehicles (EV) develop fast and became popular due to their zero emission and high tank-to-wheels efficiency. However, some factors limit the growth of the electric vehicle, especially performance, cost, lifetime and safety of the battery. Therefore, the management of batteries is important in order to reach the maximum performance when operating at various conditions. Battery Thermal Management Is one among the key function of BMS system of battery. during this the various thermal aspects of battery such as Heating, Cooling, Ventilation and Vibrations of battery is regulated to take care of the constant battery temperature at require level during the battery Charging and Discharging process to ultimately improve its Life Cycles and efficiency. The cycle life goes down slowly below 10°C due to anode plating causing sluggish chemical reactions and drops off quickly above 60°C due to the breakdown of electrode materials. Thus, Generally the temperature must be controlled between 20°C and 40°C to make sure the performance and cycle life for the chemical batteries like Lithium-ion.

Rate of warmth transfer by Convection and conduction can be enhanced by the liquid fluid transfer through the heat exchangers instead of direct air cooled. to enhance cooling/heating power of passive liquid systems, there are two possible upgrades. One is thru thermo-electric modules, which can be introduced here. the most purpose of this paper is to develop a BTMS model for balancing the different cooling and heating circuits within the battery pack to fulfil the performancerequirements.

Thermo-electric module can convert electric voltage to temperature difference and vice-versa. Here the previous effect is adopted. meaning it transfers heat through the module by consuming electricity directly. Some fans with cooling and heating tubes are installed to enhance heat

transfer by forced convection. It's easy to modify between cooling and heating operation. to realize that, the poles of electrodes have to be reversed and also the temperature is maintained by regulating the voltage supply to the modules in four stages, with the assistance of PIC18F458 microcontroller. Which makes this technique universal and can be adopted in any EV at any atmospheric conditions. The combine a passive liquid cooling system with thermo-electric module, the combined system is in a position Cool-down the battery even lower than the intake air temperature, but the facility is still limited to around some hundreds of watts and less than one.

Keywords: Battery Thermal Management system (BTMS), Thermoelectric module,
PIC18F458 Microcontroller, Heat exchanger, Battery Cycle life, Electrical vehicle

OMS-22

POLYANILINE POLYETHYLENE GLYCOL THICK FILM COMPOSITES AS A LPG SENSOR

S
SHYAM S. BORWAR

Research Student in physics,
The Institute of science,
Fort, Mumbai 400032 India.
Asst. Prof. in physics,
Smt. Indira Gandhi College of Engineering,
Navi Mumbai, India
s_sborwar2019@yahoo.com

Abstract

In this paper polyaniline polyethylene glycol PANI-PEG (i.e. 0, 1, 2, 3, 4, 5 wt. %) complexes prepared by chemical method and further its pallets composite fabricated at fixed pressure by palletization technique. LPG sensing characterization of fabricated pallets carried out for at 1000 ppm using static sensing system [from Room Temperature to 750C]. A high value of SF=14517 was obtained at T~ 64 0C for a pallet with 5 wt. % PEG. Further, we obtained better LPG sensing response, SF= 4413 at T ~ 39.5 0C for a pallet with 2 wt. % PEG and remaining wt. % pallets LPG responses also done. From these, I reported that LPG sensing of fabricated pallets influenced due to PEG % additive.

Keywords : Polyaniline, Polyethylene-glycol, LPG sensor, Composite, Sensitivity factor

OMS-23

PHOTOLUMINESCENCE STUDY OF BAZN2(PO_4)$_2$:DY^{3+} ACTIVATED PHOSPHOR AND APPLICATIONS OF WLED'S

RADHIKA G. DESHMUKH[1], ABHIJEET R. KADAM[2] S. J. DHOBLE[2]

[1]Department of Physics, Shri Shivaji Science College, Amravati- 444603, India
[2]Department of Physics, R. T. M. Nagpur University, Nagpur – 440033, India
Contact email: radhikadeshmukh35@gmail.com

Abstract

In the realm of luminous spectroscopic applications for many years, phosphorus (PO_4) phosphors have been a viable candidate. The suggested study employs a low temperature, simple combustion approach to create Dy^{3+} activated $BaZn_2(PO_4)_2$ phosphors utilizing urea as a fuel. The proposed sample's phase and crystal structure were both validated by XRD. The proposed sample's photoluminescence analysis validates the spectra in the blue and yellow regions. These findings demonstrate that Dy^{3+} activated $BaZn_2(PO_4)_2$ phosphors are a strong contender for WLED lighting applications.

OMS-24

PHOTO AND MECHANO-LUMINESCENCE PROPERTIES OF NOVEL PROPERTIES OF $LI_4SRCA(SIO_4)_2$: EU^{3+} ADVANCE RED PHOSPHOR

DIPTI SAHU, D.P. BISEN, NAMEETA BRAHME

School of Studies in Physics and Astrophysics
Pt. Ravishankar Shukla University, Raipur-492010, Chhattisgarh, India
Corresponding Author: dipti8332@gmail.com
diptisahu399@gmail.com

Abstract

Eu3+ doped phosphor $Li_4SrCa(SiO_4)_2$ is prepared by solid state reaction method. The study of crystal Structure, phase purity and calculate the crystallite size of prepared phosphor were done by X-ray powder diffraction technique. Photoluminescence spectra of Eu^{3+} doped $Li_4SrCa(SiO_4)_2$ phosphors shows red intense peak at 591nm and 619nm was due to $^4D_0$-$^7F_1$ and $^4D_0$-$^7F_2$ transition respectively. Mechanoluminescence study of UV irradiated Eu^{3+} doped $Li_4SrCa(SiO_4)_2$ phosphors and show good Mechanoluminescence (ML) properties. This phosphor may be used for solid-state lighting and as a pressure sensors.

OMS-25

MICROWAVE HYDROTHERMAL SYNTHESIS OF MOS2 SPHERICAL NANOSTRUCTURES AS HYDROGEN EVOLUTION REACTION CATALYST

CHANDRAKANTHA KAMPALAPURA SWAMY,a AND SRIKANTASWAMY SHIVANNA,* a,b

aCentre for Materials Science and Technology, Vijnana Bhavan, University of Mysore, Manasagangotri, Mysore 570006, India.
b Department of Studies in Environmental Science, University of Mysore, Manasagangotri, Mysore 570006, India.
* Corresponding author e-mail:srikantas@hotmail.com (Srikantaswamy Shivanna)

Abstract

Low-cost, high-efficient hydrogen evolution reaction (HER) catalysts are crucial requirements for the advancement of a hydrogen gas-based energy economy. The extraordinary features of two-dimensional (2D) metal chalcogenide materials can be used as HER catalysts, ultra capacitors, and in solar cells. The majority of documented catalysts synthesis are time-consuming, complex, and inefficient. However, this work demonstrates the synthesis of amorphous MoS2 spherical flower catalysts via a microwave hydrothermal synthesis method. The prepared catalysts were characterized using XRD, SEM, EDX, BET, TEM, and XPS. In addition, To validate it as an electrochemical catalyst for the hydrogen evolution reaction (HER), CV, LSV, and impedance analysis have been carried out. These results suggest that the catalyst has a high specific surface area and conductivity, delivering a favourable conductive network for high hydrogen production from MoS2 spherical nanosheets along with rapid charge transfer kinetics. As-produced MoS2 exhibits superior electrocatalytic activity for the HER in an acidic medium, with a low onset potential of 52 mV and a Tafel slope of 42 mV/decade. Beyond excellent catalytic activity, MoS2 reveals long cycling stability with a very high cathodic current density of around 400 mA cm-2 at an overpotential of 240 mV. Furthermore, with a low activation energy of 46 kJ/mol, the MoS2 catalyst exhibits excellent HER activity at temperatures ranging from 30 to 60 °C, allowing for practical scalable processing of the catalyst. The influence of preparation temperature was also discussed. Compared to commercial bulk MoS2, and as prepared MoS2, due to the special structure of nanoflowers assembled by much more active S sites, our research has provided a new approach to achieving enrichment of S

edges on Molybdenum disulfide, which may have potential use not only for electrocatalytic HER but also for other electrochemical applications.

Keywords: amorphous MoS2 NF, HER catalyst, nanoflowers, microwave hydrothermal, metal chalcogenide

OMS-26

MICROWAVE ASSISTED HYDROTHERMAL SYNTHESIS OF BI2O3/AG2O HETEROSTRUCTUREWITH HIGHLY ENHANCED PHOTOCATALYSIS AND THEIR BIOLOGICAL INTEREST

DEEPU H.R,a ABHILASH M.R, DHANANJAY K.P, AANJU KB ND SRIKANTASWAMY SA, b*

aCentre for Materials Science and Technology, VijinanaBhavan, University of Mysore, Manasagangotri, Mysore - 570 006, India
bDepartment of Studies in Environmental Science, University of Mysore, Manasagangotri, Mysore - 570 006, India
* Corresponding author e-mail: dho(SrikantaswamyShivanna)

Abstract

A methodological analysis is made in the rational synthesis of the Bi2O3/Ag2O nanostructure with significant application, possessing substantial electron-hole recombination acting as solar catalysts through powerful and modest hydrothermal technique. The composite Bi2O3/Ag2O is intermediary for single step Methyl Red (MR) dye photocatalytic degradation. Under the impact of solar irradiation heavy metals like, Lead (Pb) are also removed by the synthesized material surface influence of sunlight. Anti-cancer activity upon Colon cancer cells (HCT116) is achieved with excellent cell viability and IC50 value. The research work or the present study found an excellent and efficient design of photocatalyst as an eco-friendly and biomedical approach.

Keywords: Photo catalytic degradation, Colon cancer cells (HCT116)and Methyl Red (MR).

OMS-27

Photoluminescence study of GdOF:Pr^{3+} phosphor

SUMEDHA TAMBOLI[a]*, GOVIND B. NAIR[a], S. J. DHOBLE[b], H. C. SWART[a]

[a]Department of Physics,
University of the Free State,
P. O. Box 339, Bloemfontein, 9300, South Africa
[b]Department of Physics,
R.T.M. Nagpur University,
Nagpur, 440033, India
Corresponding Author: *sumedhatamboli@yahoo.com

Abstract

Rare-earth lanthanide doped nano-phosphors show intense photoluminescence in the visible region. They are researched for applications such as bio-imaging, optical thermometry, light-emitting devices, and data storage. This work selects GdOF as a host for rare-earth ion doping. Pr^{3+} doped GdOF phosphors were synthesized via the microwave-assisted co-precipitation method. The formation of compounds was confirmed by analyzing their X-ray diffraction pattern. A photoluminescence study was carried out, which showed intense cyan and red emission under UV excitation. Blue light can also excite this phosphor, which enables the possibility of using these phosphors for solid-state lighting.

Keywords: GdOF, microwave synthesis, photoluminescence

OMS-28

SIMPLE COMBUSTION ASSISTED TB^{3+} - ACTIVATED $CAALSIO_4F$ PHOSPHOR FOR SOLID STATE LIGHTING AND WLEDS APPLICATIONS

TOSHI S. DHAPODKAR*, ABHIJEET R. KADAM AND S. J. DHOBLE

Department of Physics,
R.T.M. Nagpur University,
Nagpur- 440033, India
*Corresponding author email: toshi.dha1902@gmail.com

Abstract

The proposed investigation mainly focusses on the development of the Tb^{3+} - activated luminescent phosphor for the applications of the solid-state lighting and LEDs. In this present study, we have prepared a series of the Tb^{3+} doped $CaAlSiO_4F$ phosphors via simple combustion route using citric acid as a fuel. The synthesized phosphor further characterized by the X-ray diffraction (XRD) for the structural analysis, Fourier Transform Infrared (FTIR) Spectroscopy for investigating the vibrational features, Photoluminescence (PL) properties for the analysis of the excitation and emission spectra and CIE chromaticity properties.PL excitation spectra of the proposed phosphor emission wavelength of 543 nm gives two characteristic excitation peaks at 350 nm due to $^7F_6 \rightarrow {}^5G_5$ and a doublet at 370 and 378 nm belongs to $^7F_6 \rightarrow {}^5L_9$ and $^7F_6 \rightarrow {}^5L_{10}$ excited states, respectively. PL emission spectra of this phosphor shows strong emission peak at 543 nm attributed to $^4D_4 \rightarrow {}^7F_5$ transition while another emission peak at 485 nm corresponding to $^5D_4 \rightarrow {}^7F_6$ transition of Tb^{3+} ions at excitation of 378 nm respectively. Moreover, CIE colour co-ordinates are also located in greenish region which confirms the potential of this phosphor as a green component for WLEDs and display devices applications.

Keywords: Combustion synthesis; citric acid; WLEDs; phosphor; photoluminescence

OMS-29

BA0.5NA0.48SR0.02TIO3 DOPED WITH SR: EFFECT OF HYDRAULIC COMPACTION PRESSURE ON SINTERABILITY AND ITS IMPACT ON ELECTROCHEMICAL BEHAVIOUR.

ROSHAN B. RAUT1A, SHRADDHA SHIRBHATE1, SMITA ACHARYA1A

1 Advance Material Research lab,
Department of Physics,
R.T.M. Nagpur university Nagpur -440033, India
a) roshan.raut124@gmail.com & saha275@yahoo.com

Abstract

Ba0.5Na0.48Sr0.02TiO3 (BNST) ceramics material successfully synthesized by using the sol-gel combustion method. The XRD demonstrated the presence of a cubic phase over the whole compositional range. BNST material compacted for three different compaction pressure 5ton, 7ton and 9ton respectively by using hydraulic pellet press and was sintered at 1000°C for 6 hours. The influence of different compaction pressure on sinterability and electrochemical behaviour Ba0.5Na0.48Sr0.02TiO3 (BNST) ceramics was examined as a function of temperature. The dielectric response of grains is significantly influenced by oxygen vacancies.

OMS-30

SYNTHESIS, STRUCTURAL & ELECTRICAL STUDY OF SR DOPED ON NANOCRYSTALLINE GD2TI2O7 PYROCHLORE MATERIAL AS ELECTROLYTE FOR IT-SOFCS

ARSHIYA A. A. ALI1, SHRADDHA SHIRBHATE1, SMITA ACHARYA1

Advanced Materials Research Laboratory,
Department of Physics,
RTM Nagpur University,
Nagpur, 440033, M.S., India
aliarshiya69@gmail.com, saha275@yahoo.com

Abstract

Doped Gd2Ti2O7 pyrochlore-based system is emerging as a promising candidate as solid electrolyte for electrochemical energy devices, especially solid oxide fuel cells (SOFC) by exhibiting high oxy-ion conductivity at the Intermediate temperature range (400-6500C). In this interesting article, we explore Strontium doped gadolinium Titanate pyrochlore system Gd2xSrxTi2O7, where x = 0,0.2 and 0.4, the synthesis of nanocrystalline Gd2Ti2O7 material by sol-gel combustion method in view to develop oxy-ion conductor for IT-SOFCs. Structural confirmation was done by using X-ray diffraction (XRD). XRD analysis revealed that Gd2Ti2O7 has a cubic structure with an Fd-3m space group. Rietveld refinement of XRD data was performed by using the Full-Prof suite to get more structural clarity and the effect of Sr dopant on the structure. We demonstrate the pure pyrochlore structure of Gd2Ti2O7 with the lattice parameter equal to ~10 Å, which matches the reported study [1-2]. Electrochemical impedance spectroscopy (EIS) was studied by all compacted compositions to extract the ionic conductivity data. The behaviours were studied at an operating temperature range of 250–650°C. Extracted information of ionic conductivity exhibits (1.5x10-4, 8.12x10-4, and 1.43x10-3 S/Cm @6500C for GTO, GSTO2, and GSTO4, respectively). As compared to pure GTO dopant effect replicate systematic rise in conductivity GSTO4 has shown maximum ionic conductivity. The conductivity obtained in the present work is closely matched with that reported once [3-4]. Scanning electron microscopy have been carried out to study the particle size distribution and weight percentage doping of Sr in Gd2Ti2O7, respectively

Keywords: Gd2Ti2O7 pyrochlore, Impedance spectroscopy, Ionic conductivity, IT-SOFC.

OMS-31

MICROSTRUCTURAL EFFECT ON CHARGE RELAXATION PHENOMENON OF DOPED CERIA AS ELECTROLYTE FOR IT-SOFCS

SHRADDHA C, SHIRBHATE1* & SMITA A. ACHARYA1

1Advanced Material Research laboratory,
Department of Physics,
R.T.M. Nagpur University, Nagpur,
Maharashtra India 440033.
*Email:shraddhamshrirao@gmail.com

Abstract

Aliovalent doped ceria (ADC) is emerging as a potential electrolyte for intermediate temperature solid oxide fuel cell (IT-SOFCs). Ionic conductivity in the range of (1 to 10-2 S/cm) at intermediate temperature (400-700oC) is highly desirable for electrolytes of IT-SOFCs. In doped ceria system, role of dopant's and microstructural feature are sole factors to tune ionic conductivity. In the present attempt, aliovalent doped ceria systems (Ce0.85M0.15O2-□) are developed by using different dopants such as M = Sm, Gd, Nd, Dy, Ca and Sr. Microstructure of the system are tailored by using three different modes of sintering; viz conventional (CS), microwave-assisted (MS) and field-assisted sintering (FAS). FAS sintering produces high-density pellets of doped ceria with fine grain-growth and grain size of about 200 nm, while the conventionally densified pellets exhibited high grain-growth rate with average grain-size of 800 nm. Microwave-assisted sintering exhibit uniformity in grain growth having average grain-size of 600 nm. Role of microstructure on ionic conductivity and charge relaxation is revealed by impedance spectroscopic technique. Oxy-ion relaxation time and activation energy of charge relaxation at grain boundaries is lowest for CS-processed samples. The ionic conductivity of the CS-NDC pellet sintered by conventional sintering is found to be highest 2.42 × 10−2 S cm−1 at 650oC amongst all studied systems. Influence of grain boundaries microstructure (i.e. thickness) on space charge potential are estimated from Mott Schottky Approach and shows FAS sample possessess highest potential. The correlations between the grain, grain boundary relaxation and ion transport mechanism in the doped ceria system are systematically established.

Keywords: IT-SOFC, Field assisted sintering (FAS), Microwave-assisted sintering (MS), conventional Sintering (CS).

OMS-32

BAGAPHANE: PROPOSED HANDMADE PAPER FROM SUGARCANE BAGASSE AND THEIR CELLULOSE NANOFIBRILS REINFORCED IN PVA COMPOSITE FOR FOOD PACKAGING FILM

ASHLESHA P. KAWALE1 AND ARTI SRIVASTAVA1*

1*Department of Chemistry,
Guru Ghasidas Vishwavidyalaya,
Bilaspur, Chhattisgarh- 495 009, India

Abstract

Industry people have become more cautious about garbage disposal as a result of thenegative effects of pollution. Waste management entails waste collections, transportation anddisposal. The management of trash varies depending on their form and character. Reduce, reuse, and recycle are the three R of waste management that should be followed wherever practicable. As a result, the sugarcane bagasse used in this study is an environmentally benign raw material. Sugarcane bagasse is a widely available agricultural waste that has been employed in a variety of applications, with its potential as a source of cellulose gaining interestin a variety of fields. The study investigates that acid hydrolysis was used to get cellulose outof sugarcane bagasse which was then used to make handmade paper. Even cellulose nanofibrils extracted from sugarcane bagasse can serve as reinforcing components in biocomposite films due to their high aspect ratio and improved mechanical strength. To increase the tensile strengthof polyvinyl alcohol films, cellulose nanofibrils (CNFs) were extracted from sugarcane bagasse and employed for food packaging in this study.

Keywords- Sugarcane bagasse, cellulose, PVA, composite, gelatin, film, SEM

108th INDIAN SCIENCE CONGRESS
3 – 7 January, 2023
Nagpur

V

Abstract of
POSTER PRESENTATIONS

PMS : 1

WIRELESS AC POWER DETECTOR

TUSHAR TANAJI JADHAV

Student of electrical engineering program
Guru Gobind singh college of engineering & research centre nashik, Maharashtra

Abstract

In Industries accident takes place due to leakage of electricity. The accidents can be avoided by using the wireless AC line detector. The motive of this project is to detect presence of electricity wirelessly. The concept of working behind this project is that a live wire has alternating current flowing through it. These also radiate from the wires and hence can be felt by a nearby sensing circuit which is properly tuned to do so.This simple project has the capability to sense a flow of alternating current around its vicinity without even having a physical contact with the live wire. The concept of working behind this project is that a live wire has alternating current flowing through it. These also radiate from the wires and hence can be felt by a nearby sensing circuit which is properly tuned to do so. The project has an antenna which does this task of receiving these radiated waves. The AC signal from the input is then superimposed on this bias voltage to vary the bias current. Then, the amplified output is taken from the collector and emitter. Variations in the bias current are amplified in the output current. Recall that a voltage divider is simply a pair of resistors. The received waves are then converted into a human recognizable form with the help of a processing circuitry. Thus the circuit gives an audio visual signal in the form of pulsating buzzer and LED to let the user with the device inspecting the live wire know that there is a current flowing through the live wire. An antenna is an important part of any circuitry which is intended to receive incoming wireless signals. The radiated AC line signals are received by this antenna. These signals are then amplified and fed to the LED blink circuit section. Hence when the LED starts blinking the person testing the wire can know that the wire is Live and hence should be played safe with

Key Words :- LED - Light Emitting Diode ; AC - Alternating Current

PMS2

TRI-HYBRID ELECTRICAL ENERGY GENERATION METHOD BY USING MICROBIAL FUEL CELL, SOLAR AND WIND ENERGY

SUNIL MAGAN MORE

Assistant Professor
Electrical Engineering Program
Guru Gobind Singh College of Engineering& Research Centre Nashik, Maharashtra
Email- sunil.more@ggsf,edu.in
Dr.Permindur Singh
Executive Director
Guru Gobind Singh Foundation Nashik, Maharashtra

Abstract

This paper reviews Microbial Fuel cell. First objective is to discuss microbial fuel cell. Second objective is to put forth various experiments done by me in generating electricity through microbial fuel cell. Till now majority of Microbial Fuel cell are using graphite as anode and cathode separated by Proton exchange membrane. I have used Graphite and Magnesium as electrodes for generating electricity in single chamber without any membrane. This MFC can be used for various applications.

Also a new concept of generating electricity with solar panels and using the area beneath it for generating energy with MFCs, while at the same time a small wind turbine while be used as a third hybrid electricity generating partner. This technology can revolutionize the current energy production method. Also the reason behind bringing this technology into light is to show that it is green, free, hazard free, flexible, compact and unending availability. One can generate electricity at home for own consumption.

Microbial cell is a very easy and simple method to get energy from soil. This battery generates voltage of 1.5 to 1.8 volts. It is totally green and renewable. This energy can be used to turn on led lights, buzzers, calculators, digital watches etc. Tomorrow we may see this energy being used in many Gadgets (as energy requirement for electronics devices getting reduced day by day).

PMS-3

EFFECT OF NI SUBSTITUTION ON STRUCTURAL AND MAGNETIC PROPERTIES OF MN-ZN FERRITE NANOPARTICLES

F. A. AHMED[1], AND L. N. SINGH[2]

[1]Department of Physics,
Fajandar Women Degree College,
Vahoor, Raigad-402301, M.S., INDIA
[2]Department of Physics,
Dr. Babasaheb Ambedkar Technological University,
Lonere, Raigad-402103, M.S., INDIA.
Corresponding Email: faliahmed@yahoo.com

Abstract

The ferrite samples of $Mn_{0.5-x}Ni_xZn_{0.5}Fe_2O_4$ (x=0.0, 0.1, 0.2, 0.3) have been prepared by sol-gel method using chlorides of respective metal ions. The phase purity of the samples was investigated by XRD. The analysis of XRD patterns displays the formation of single-phase cubic spinel structure. It is found that lattice parameter decreases with increase in Ni content. It has been also observed that saturation magnetization increases up to x=0.1 and then decreases with increase in Ni content.

Keywords: Lattice parameter, sol-gel, XRD, saturation magnetization

PMS-4

INFLUENCE OF THE SN DOPING ON THE GAS SENSING PROPERTIES OF $BATIO_3$ FOR NO_2 GAS DETECTION

RAJENDRA P. PATIL[1] , THAKARE SATISHKUMAR[2]

1.Department of Chemistry,
Bhonsala Military College Nashik
Maharashtra - 422005, India.
2. Department of Chemistry,
KRA College Deola Tal Deola
Dist: Nashik Maharashtra - 422005, India

Abstract

The formation of polar nano-regions with small concentration doping of Sn into $BaTiO_3$ nanostructures controls the enhanced gas sensing response to NO_2 gas at room temperature. Appropriate Sn doping in BaTiO3 nanostructures not only modifies the electronic structure but is also responsible for the extended phase transition in the $BaTiO_3$ crystal structure. Here in this study, we performed transmission electron microscopy of Sn doped $BaTiO_3$ samples to observe the formed polar nanoregions. 0.2 M% Sn doped $BaTiO_3$ has a high polarizability value, so that it can adsorb NO_2 gas on the surface of a thick film resistor based gas sensor at room temperature.

Keywords:-Keywords:-polar nano-regions, diffused phase transitions, relaxor behavior, density of states.

PMS-5

ANTIBACTERIAL ACTIVITY OF ZnO NPs AGAINST CLINICALLY EXTRACTED GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA

P.R. KANDALKAR[1], Y.A. GADHIKAR[1] S.A. WAGHULEY*[2],

[1]Department of Zoology,
Govt. Vidarbha Institute of Science and Humanities,
Amravati 444 604, India.
[2]Department of Physics,
Sant Gadge Baba Amravati University,
Amravati 444 602, India.
*Corresponding author Email: sandeepwaghuley@sgbau.ac.in

Abstract

In this research, the antibacterial activity of one pot synthesized zinc oxide (ZnO) nanoparticles (NPs) against clinically extracted Gram-negative and Gram-positive bacteria is determined. *Escherichia coli* (*E. coli*) and *Staphylococcus aureus* (*S. aureus*) were used as test microorganisms. The NPs of ZnO were synthesized by one pot chemical precipitation method using hexamethylenetetramine (HMT). The particle size was found to be 38.78 nm with lattice strain of 0.0095. This was confirmed from SEM analysis. The antibacterial activity of NPs was studied using bacteriological tests of well diffusion agar method. These tests were performed in nutrient broth and nutrient agar following standard method. The minimum inhibitory concentration (MIC) was determined using three different concentrations of ZnO NPs including 0.1, 0.3 and 0.5 mg/ml. The MIC value for both *E. coli* and *S. aureus* was found to be 0.1 mg/ml. The results showed that ZnO NPs have antibacterial inhibition zone of 13 and 15 mm at the concentration of 0.5 mg/ml against *E. coli* and *S. aureus*, respectively. From statistical analysis, it was found the rejection of the null hypothesis. This shows the unequal variances of the two bacteria (*E. coli* and *S. aureus*). ZnO NPs was found to be efficient in killing *E. coli* isolate as compared to *S. aurues* at lower concentration, while, reverse effect was observed at high concentration.

Keywords: Nanoparticles; Zinc oxide; Antibacterial activity; Well diffusion method.

PMS-6

STRUCTURAL PROPERTIES OF $NI_{1-X}CD_XFE_2O_4$ SYNTHESIZED VIA TRADITIONAL DOUBLE SINTERING SOLID STATE REACTION

B.H. DEVMUNDE[a*], SUDARSHANA G. BADHE[b], M.S. PATIL[c], S.J. SHUKLA[a]

[a]Department of Physics, Vivekanand Arts, Sardar Dalipsingh commerce and science college, Aurangabad 431001 INDIA
[b]Department of Physics, R.B. Attal Arts, Science and Commerce College, Georai, Beed, 431127 INDIA
[c]Department of Physics, Yashwantrao Chavan College, Sillod, Aurangabad 431112 INDIA
[e]Department of Physics, Deogiri College, Aurangabad 431001 INDIA
Email:bhdevmunde05@gmail.com

Abstract

In this study, the structural characteristics of Ni-Cd ferrites having general formula $Ni_{1-x}Cd_xFe_2O_4$(x=0.0, 0.2, 0.4) were synthesized using the traditional double-sintering solid state reaction process at 1120 °C for 24 hours. The samples' single phase spinel structure was validated by the X-ray examination. The XRD pattern was used to estimate the structural characteristics, including the lattice parameter, bulk density, X-ray density, porosity, cation distribution, bond length, and hopping length of the tetrahedral (A) site and octahedral [B] site. The XRD confirmed the existence of $Ni_{1-x}Cd_xFe_2O_4$ as a single phase with cubic geometry, spinel structure, and ferrite phase. The IR demonstrates that the distinctive ferrite bonds were verified. Scherrer's formula was used to compute the average crystalline size. Due to cadmium's large ionic radius, the lattice parameter increased with cadmium presence.

Keywords: X-ray diffraction; Ferrite; SEM; Infrared spectra

PMS-7

GRAPHENE BASED NANOCOMPOSITES ENHANCED FENTON PROCESS FOR AZO DYE DEGRADATION

BHAWANA JAIN[A], AJAYA K. SINGH[A*]

[a*]Department of Chemistry, Govt. V. Y. T. PG. Autonomous, College, Durg, Chhattisgarh, 491001, India.

Abstract

The design and fabrication of smart and low-cost nanocomposites (NCs) is still an area of challenge in wastewater treatment. In this context, firstly individual graphene oxide (GO) and cerium oxide (CeO_2) nanoparticles (NPs) were synthesized by precipitation method. This was followed by synthesis of GO-CeO_2 NCs by mixing GO and CeO_2 NPs in natural surfactant which was characterized by UV-visible absorption spectroscopy. The morphology of the synthesized GO-CeO_2 NCs established by scanning electron microscopy (SEM) studies while high resolution transmission electron microscopy (HRTEM) analysis revealed shape and particle size of NCs. Fourier transform infrared spectroscopy (FTIR) was used to determine the presence of different functional group in the synthesized GO-CeO_2 NCs and thermal stability was determined by thermal gravimetric analysis (TGA). The synthesized GO-CeO_2 NCs was used as catalyst in heterogeneous Fenton process for the degradation of methyl violet (MV) dye. The effects of various experimental parameters, i.e., pH, H_2O_2, GO-CeO_2 NCs for MV degradation were investigated to have optimum condition. The optimum conditions for effective degradation with 98% was achieved just within 100 minutes, at pH 8, [H_2O_2] 80X10^{-4}M, and [GO-CeO_2] 18 mg/L for 3X10^{-3}M degradation. The experimental observations have led up to propose a most plausible mechanism for GO-CeO_2 NCs enhanced Fenton's degradation of MV.

Keywords: GO-CeO_2 nanocomposites; Methyl violet; Heterogeneous Fenton's process.

PMS-8

PHASE BEHAVIOUR AND CRYSTAL STRUCTURE OF 2', 3'-DIFLURO-4-METHYL-P-TERPHENYL (1T0)

PARTHA PRATIM DASa , SAKUNTALA GUPTAb

aBhagilata High School (H.S.),
Kantore, Raiganj, Uttar Dinajpur,
Pin -733156. W.B., India.
bDepartment of Physics,
Raiganj University, Raiganj,
Uttar Dinajpur, Pin – 733134. W.B., India

Abstract

The crystal structure of 2', 3'-difluro-4-methyl-p-terphenyl (1T0) has been determined by single crystal X-ray diffraction. The unsymmetrical substituted compound 2', 3'-difluro-4-methyl-p-terphenyl (1T0), the crystal structure is disordered, with molecules statistically entering the crystal in up and down orientations, with full superposition of all the atoms but the terminal groups is H/Methyl. Monoclinic 2', 3'-difluro-4-methyl-p-terphenyl (1T0) space group is C2. Feature of the conformation of the compound is the non-coplanar twisted arrangement of the three rings of the p-terphenyl moiety. 2D Hirshfeld fingerprint plots are consistent with H···H and C···H contacts in the crystal packing.

Keywords: Crystal structure, difluorine derivatives of p-terphenyl, disorder of terminal group.

PMS-9

X-BAND MICROWAVE IRRADIATION EFFECTS ON IN-VITRO URICITE CRYSTAL GROWTH IN FRONT OF PYRAMIDAL HORN ANTENNA

A. C. BHAGAT*
Post-Graduate Department of Physics,
J. E. S. College, Jalna -431203 Maharashtra (India).
*Corresponding Author:(A. C. Bhagat),dstphy@gmail.com,

Abstract

The precise study of crystals reveals it's important to understand the growth of various crystals significantly and it is a primary stage of kidney stones that are grown in human, bird and animal bodies which is major health problem all over the world. In this research paper, the effect of X-Band microwave irradiation has been studied on the Uric Acid crystal growth at nucleation state by using single diffusion gel method. Also the effect for various period of irradiation, size, morphology and yield of crystals has been recorded. The grown crystals are characterized by using XRD and FTIR method.

Keywords- Uric acid (Uricite) Crystal, Single Diffusion in Gel, Microwave, Pyramidal Horn Antenna, XRD, FTIR.

PMS-10

IMPACT OF DY DOPING ON STRUCTURE AND PHOTOLUMINESCENCE PROPERTIES OF SAMARIUM VANADATE

BHAVANI CHAKRAVARTI[a]*, ANAND PRAKASH MISHRA[a] AND RAJAN KUMAR SINGH[b]

[a] Department of Chemistry.
Dr. Harisingh Gour University,
Sagar, M.P. 470003, India
[b]Department of Chemical Engineering,
National Taiwan University, Taipei, Taiwan, ROC
*To whom you should address all correspondence.
Email addresses : bhavaniprajapati87@gmail.com

Abstract

In this research work, $SmVO_4$ and Dy^{3+} doped $SmVO_4$ have been synthesized by hydrothermal method. The formation of the tetragonal crystalline phase is demonstrated by the P-XRD graph. According to functional group analysis, Sm-O absorption is associated with the band at 529 cm^{-1}. The symmetrical stretching caused by the V-O vibration of the VO_4^{3-}group corresponds to a strong band near 775 cm^{-1}. Furthermore, from PL emission spectra, it can be seen that the most intense emission peaks were noticed at 550 nm (caused by $^4F_{9/2}\rightarrow{}^6H_{13/2}$ transition ofDy^{3+} and $^4G_{5/2}\rightarrow{}^6H_{5/2}$ of Sm^{3+}) and at 663 nm (due to $^4F_{9/2}\rightarrow{}^6H_{11/2}$) on excitation at 405 nm.

Keywords:- Samarium vanadate, orthovanadate, Zircon type structure, Photoluminescence, monazite-type structure.

PMS-11

INVESTIGATION THE STRUCTURAL, OPTICAL AND MORPHOLOGICAL PROPERTIES OF PURE AND CUO DOPED POLYPYRROLE

YASHAVANT P. GUTTE[1], SHILPA P. DHANVE[2], CHANDRAKANT T. BIRAJDAR[3*]

[1,2,3]Shri. Madhavrao Patil Mahavidyalaya Murum, Ta.Omerga
Dist.Osmanabad-413605 (Maharashtra)
Corresponding Author: dr.ctbirajdar@gmail.com
(Dr. Chandrakant T. Birajdar)

Abstract

Herein, we presented the effects of copper oxide (CuO) nanoparticles on the structural, optical and morphological properties of polypyrrole (PPY). Pure PPY and PPY-CuO nanocomposites were prepared via chemical oxidative polymerization technique in sulphuric acid aqueous solution. Structural, optical and morphological properties of the synthesised materials were characterised using the X-ray diffraction (XRD), ultraviolet-visible (UV-vis.) spectroscopic and field emission scanning electron microscopy (FESEM) techniques respectively. The amorphous nature of the pure PPY was confirmed by the structural study and PPY-CuO also shows the same nature without any considerable change. Optical study shows the two absorption peaks at 256 and 450 nm in pure PPY and PPY-NiO shows the slight shifting in the absorption peaks due to the doping. Morphological study agreed with the XRD study and shows the amorphous nature.

PMS-12

INVESTIGATION THE DIVERSE PROPERTIES OF COPPER OXIDE NANOPARTICLES DOPED POLYANILINE (PANI-CUO) NANOCOMPOSITE

PRIYANKA G. PATIL1*, SANJAY K. VYAWAHARE2

1,2 Deogiri College,
Aurangabad-431004 (Maharashtra)
Corresponding Author: Priyanka.chandile@gmail.com (Priyanka G. Patil)

Abstract

Organic/inorganic composites have gained the tremendous attraction from the research community due to their technological applications. Herein, we reported the pure polyaniline (PANI) and polyaniline-copper oxide nanocomposite (PANI-CuO) synthesized via chemical oxidative techniques. As synthesized pure PANI and PANI-CuO nanocomposite were studied by X-ray diffraction (XRD), ultraviolet-visible (UV-vis.) and Fourier transform infrared (FTIR) spectroscopy and Field emission scanning microscopy (FE-SEM). The structural study shows the semi-amorphous nature of pure PANI sample and PANI-CuO not merely affected the structure of PANI. Optical bandgap was calculated using the UV-vis. absorption and it shows ~3.8 eV for pure PANI and for PANI-CuO it shows 3.2 eV. All the expected functional groups are reveals in both pure PANI and PANI-CuO samples which was confirmed by FTIR spectroscopy. FESEM pictures of the samples shows the agglomerated amorphous nature of both the samples.

PMS-13

STRUCTURAL AND MORPHOLOGICAL STUDY OF $BI_{0.5}NA_{0.5}TIO_3$

DIBYARANJAN DAS, ARPITA PRIYADARSHINI DIKSHIT, KAJAL PARASHAR, S.K.S. PARASHAR*

Nanosensor Lab, School of Applied Sciences, Kalinga Institute of Industrial Technology, Deemed to beUniversity, Bhubaneswar-751024, Odisha, India
* sksparashar@yahoo.com

Abstract

Bismuth sodium titanate$Bi_{0.5}Na_{0.5}TiO_3$(BNT) is regarded as a promising possibility for a crucial material in lead-free ferroelectricceramicsThe structural analysis of ferroelectric perovskite material bismuth sodium titanate(BNT), was investigated by means of X-ray diffraction(XRD). XRDwas used to analyse the phase development and structural investigation, which revealed a well-developed crystallite with a pure perovskite phase. At room temperature, BNT has been assumed to have the rhombohedral structure with space group R3c. BNT was discovered to have a rhombohedral structure with chemically ordered bismuth and sodium atoms in the perovskite A-site and titanium in the B-site. The ceramic was prepared by solid state reaction route and sintered at temperature 1150 °C. The scanning electron microscopic (SEM) micrograph confirms the proper growth of the grains without any impurity. The detailed information on local distortions and ionic configurations in crystalstructures of BNT was obtained by using Raman spectroscopy.

Keywords: Ferroelectric ceramics, perovskite, rhombohedral space group

PMS-14

EFFECT OF AMINO FUNCTIONAL GROUPS ON VARIOUS PROPERTIES OF PMMA AND THEIR NANOCOMPOSITES

PARAMJIT SINGH, HARI MADHAV, NEETIKA SINGH, GAUTAM JAISWAR*

1Department of Chemistry,
Dr. Bhimrao Ambedkar University, Agra, India.
*Corresponding author Email: gjaiswar@gmail.com

Abstract

Functional polymers have a wide range of applications i.e. biomedical applications, self-healing polymers, OLED devices, optical applications, etc. due to improved plasticity, ductility, heat resistance, etc. The present study contributed to reinforcing the concept of functionalization to design facile and cost-effective material with desired properties or tweak the existing properties of polymers. The advancement of this research work provided insight into the effect of different amino functional groups on the optical properties such as UV shielding, morphology, fluorescence, and crystallinity of PMMA. Results indicated that PHNG3 exhibited very strong UV absorption in comparison with other fun-PMMAs. The chemical shift (δ) at ~3.5 ppm for β-NH/NH2 and the existence of aromatic protons at ~7.138 to 9.134 ppm confirmed the functionalization of PMMA.

Keywords: Functionalization, PMMA, Optical properties, NMR, Fluorescence

PMS-15

"SWIMMING WITH THE SHARKS" SUSTAINABLE DESIGN FOR WOMEN EMPOWERMENT IN THE ERA OF SCIENCE AND TECHNOLOGY

JAYASHREE VENKATESH
Department of Apparel Technology and Management,
Bangalore University, Bangalore- 560056, India.
venkatesh.jayashree@gmail.com

Abstract

It is important that science and technology creates synergy for the wellbeing with sustainable design process as well as product exploration. The cost and optimization of any technology is determined on factors not necessarily related to the absolute cost of the technology, beyond the return on investment and payback but what needs to be ascertained are intangible and not directly quantifiable benefits. The present market is evaluated by costing, networking, distribution and sustainability. There is tremendous scope for researching and developing niche products like nursing pads to meet up with the demands of current time. Further, research on women's specific requirements, challenges and concerns are rarely attempted and this research addresses those concerns. Therefore, with increasing customer demand and functional product manufacturing in sustainable manner has created an opportunity for plasma and nanomaterial's to be integrated into textile substrates. In today's healthcare environment, textile products are finding innovative applications which were unimaginable just a few years ago. The very main objective is to improve quality of health care of women by minimizing the risk of infections with sustainable design. What is the road one must take to reach science and technology to the unreachable or are we at a "cross road"? That leaves us with another question whether science and technology is a boon or bane.

Keywords: Health care, Nursing pads, sustainability, Science, Technology.

PMS-16

DEVELOPMENT OF NICKEL OXIDE NANOPARTICLES DOPED POLYANILINE (PANI-NIO) THIN FILMS AND INVESTIGATE THE STRUCTURAL, OPTICAL AND MORPHOLOGICAL PROPERTIES

SHILPA P. DHANVE1, YASHAVANT P. GUTTE2, CHANDRAKANT T. BIRAJDAR3*

1,2,3Shri Madhavrao Patil Mahavidyalaya Murum, Tq. Omerga, Dist. Osmanabad-413606 (Maharashtra)
Corresponding Author: dr.ctbirajdar@gmail.com
(Dr. Chandrakant T. Birajdar)

Abstract

Present study reported the effects of NiO nanoparticles on the structural, optical and morphological properties of polyaniline (PANI) thin film. Pure PANI and PANI-NiO thin films were prepared by soft chemical route in H2SO4 aqueous solution. The structural, optical and morphological properties of the developed thin films were characterized via X-ray diffraction (XRD), ultraviolet-visible (UV-vis.) spectroscopic and Field emission scanning microscopy (FE-SEM) techniques respectively. XRD study shows the amorphous nature of both pure PANI and PANI-NiO thin films. NiO nanoparticles not merely effects the structural properties of the PANI due to the small doping quantity. UV-vis. absorption spectrum of PANI shows the two absorption peaks at approximately 310 and 560 nm, respectively. In PANI-NiO nanocomposite, the absorption peaks slightly shifted due to the chemical interaction of the NiO with the PANI molecules. PANI shows agglomerated form and due to the doping of NiO, PANI-NiO shows the aggregated globular surface morphology.

PMS-17

STRUCTURAL AND DIELECTRIC PROPERTIES OF $SRBI_4$ TI $_4$ O_{15} CERAMICS

C. LAKSHMIPATHI1, K. SREELEKHA2, T. SUBBA RAO3

1,3 Department of Physics,
Sri Krishnadevaraya University,
Anantapur, A.P., India.
2 Department of Physics,
Government Degree College (Autonomous),
Anantapur,
A.P., India.

Abstract

The systematic analysis of structural, dielectric and conduction behavior ofSrBi 4 Ti 4 O 15 (SBT) ceramics were synthesized by solid-state route. The structuralanalysis of 4-layered Aurivillius structure with orthorhombic symmetry of SBTcompounds were studied by X-ray diffraction. The surface morphologies obtained byscanning electron microscope confirm random orientation of plate-like grains with anenhancement of grain size due to Sr content. Raman spectroscopy analysis showsshifting of peak position due to modification which is strongly correlated to theorthorhombic distortion. The dielectric behavior with response of temperature showsthe existence of diffuse phase transition and the relaxor behaviour in the material isconfirmed by analysis of temperature-frequency dependence of dielectric parameters. The Curie temperature is nearly 540o C, at higher frequencies which results indecrease of dielectric constant with increasing frequencies. The dielectric loss isfound to be very low especially at the temperature less than 500°C.

PMS-18

STUDY ON DETECTION ON SARS-COV-2 VIRUS AND ITS VARIANTS THROUGH ADVANCED NANOMATERIAL BASED BIOSENSORS

KARUNENDRA SINGH

Associate Professor,
School of Basic and Applied Sciences, Sanskriti University, Mathura, Uttarpradesh karunendra.singhsum@outlook.com

Abstract

As we know that a rapid and accurate diagnosis at the early stages of infection can prevent the disease to spread further and effective treatment get on time. SARS-CoV-2 Virus among the various viruses one of the most infectious pathogens causative of deadliest diseases in humans. the outbreak of novel coronavirus caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has resulted in over one million deaths globally. Currently, the major cause of global pandemic threats to public health, and this virus belongs to the Coronaviridae family [1]. As per the research many methods are available to detect SARS-CoV-2 symptoms. Clinical techniques included to detect SARS-CoV-2, by opting test like the detection of the presence of viral RNA from patient sample, antigen test, serology, mass and spectrophotometer etc. The major drawback of this technique is its bit longer time for detection, which needs to be figured out for developing rapid diagnostic technique. There is need to more focused on real time analysis like the method to used for early detection through RT-PCR (Real time polymerase chain reaction) based on nucleic acid amplification test and test based but there are still some problem for taking its accuracy. Advanced nanomaterial based sensor may play an important role for the diagnose of SARS-CoV-2 because of having some very promising characteristics like low detection limits and higher sensitivity and quick results with maximum accuracy. Due to change of variants of SARS-CoV-2 it is necessary to develop quick diagnostics tool for minimize the impact of COVID-19 disease. The advanced growth of medical diagnostic tools by utilizing nanobiotechnology gave rise to excellent diagnostic and therapeutic approaches, and advancements in detection techniques for future. The article main aim to focus on the methods which are more selective and advanced for the detection for SARS-CoV-2 virus.[1-2]

Keywords: SARS-CoV-2, RNA , RT-PCR and Nanotechnology

PMS-19

ASSESSMENT OF CHICKEN EGGSHELL VIS-À-VIS COMMERCIAL CACO3 AS THE CALCIUM SOURCE IN THE SYNTHESIS OF BIOACTIVE GLASS

SUJAN KUMAR CHAKRABARTI AND SUDIP KUMAR DAS

Department of Chemical Engineering, University of Calcutta
sujan.chakrabarti@gmail.com

Abstract

Bioactive glasses have found extensive use in biomedical applications (1-3). Calcium oxide (CaO) is one of the major components of the bioactive glass formulations - ranging from 10 to 45 wt %. Chicken eggshell contains ~ 88% of CaO but almost 30% of this solid waste is discarded (5,6). The present work assesses the suitability of chicken eggshell as the calcium source. Three glass samples of 45S5 Bioglass® composition (45% SiO2, 24.5% CaO, 24.5% Na2O and 6.0% P2O5, all in wt%) were synthesized with commercial CaCO3 powder, eggshell-derived CaO powder and raw eggshell powder as the calcium source for samples 1, 2 and 3, respectively. The bulk densities of the 3 glasses were 2.460, 2.316 and 2.515 gm/cc. FTIR spectra of the glasses showed the characteristic Si-O-Si glass network and the XRD showed the amorphous nature. They had similar mechanical strengths with Vickers Hardness load values of 5.074 GPa, 5.536 GPa and 5.746 GPa, respectively. The in vitro bioactivity study by immersion in SBF followed by SEM, FTIR and XRD showed very good bioactivity for all 3 glasses. Toxicity assessment by using chicken red blood cells and bacteria confirmed the non-toxic nature. So, chicken eggshell-derived CaO and raw eggshell itself can be considered as alternative calcium sources for bioactive glass manufacture.

Keywords: Bioactive Glass, chicken eggshell, calcium source, bioactivity, non-toxic

PMS-20

SYNTHESIS AND CHARACTERIZATION OF BIOACTIVE GLASS CERAMICS USING TIO2 AND ZRO2 NANO PARTICLE

TAMAL KANTI GHOSH AND SUDIP KUMAR DAS

Centre for Research in Nano Science and Nano Technology
Department of Chemical Engineering,
University of Calcutta, India
tkgcrnn_rs@caluniv.ac.in

Abstract

Bioactive glass ceramics are a special type of biomaterials consisting of both glass phase and crystalline phase processed using controlled crystallization of a base glass. Zirconium dioxide (ZrO2) and Titanium dioxide (TiO2) nano-particle containing bioactive glass-ceramics have been accepted as trusting bone implants in clinical applications due to their high mechanical properties and hydroxycarbonate apatite (HCA) formation capability. The bioactive glass-ceramics (NTGC) have been prepared using NanoSiO2-NanoAl2O3-CaO-CaF2-P2O5-NanoZrO2-NanoTiO2 systems. The glass-ceramics samples were characterized by Differential thermal analysis (DTA) for thermal behaviour and crystallization kinetics, X-ray diffraction analysis (XRD) for crystalline phase present in sintered NTGC samples, and the change in surface morphology was determined by scanning electron microscopy with energy dispersive spectroscopy (SEM with EDS). The XRD result showed that the sintered samples crystallized, and the fluorapatite phase was obtained as the main crystalline phase. In vitro bioactivity test has been carried out for biological properties. HCA layer was obtained after 28days immersion in simulated body fluid (SBF) solution on the surface of the samples.

Keywords: Bioactive glass ceramics, Crystallization kinetics, hydroxycarbonate apatite, simulated body fluid.

PMS-21

STUDY OF THE EFFECT OF MAGNESIUM CONTENT ON THE MACHINEABILITY OF BIO-ACTIVE GLASS CERAMICS IN THE SIO2-NA2O-CAO-P2O5-MGO SYSTEM

GOURAB DUTTA MUSTAFI AND SUDIP KUMAR DAS2

Department of Chemical Engineering, University of Calcutta
gourab08mustafi03@gmail.com

Abstract

Bioactive glass-ceramics elicit a unique response on their surface in contact with biological fluids, leading to strong bonding to living tissue. These materials are used in the medical field. In this study, glass-ceramics with varying MgO content in the SiO2-Na2O-CaO-P2O5-MgO system were synthesized. The samples were characterized by Differential thermal analysis (DTA) for thermal behaviour, X-ray diffraction analysis (XRD), and the change in surface morphology was determined by scanning electron microscopy with energy dispersive spectroscopy (SEM with EDS) along with Fourier transform infrared spectroscopic (FTIR) techniques. Results showed that increasing MgO content increases the crystallization peak temperature (Tp). The Avrami parameter (n) showed that the crystallization mechanism changed from surface crystallization to one-dimensional. The FTIR study identified the different bonds present in the crystal structure. SEM identified the short and long rod-like crystals and crystalline phases were fluorapatite and wollastonite for all three ceramic specimens by XRD. All the samples showed good machinability.

Keywords: Bioactive Glass Ceramics; Magnesium; Crystallization; Fluorapatite; Wollastonite; Machineable

PMS-22

ELECTRICAL CONDUCTION MECHANISM OF IODINE DOPED BLEND FILM

R Y BAKALE, G BAKALE, Y S TAMGADGE AND R P GANORKAR

Deptt.of Physics, Mahatma Fule Arts, commerce and Sitaramji Chaudhari Science Mahavidiyala Warud-444906.
reenabakale123@gmaill.com
Deptt.of ESH, Kavikulguru Institute of Technology and Science, Ramtek-441106. yogirajbakale@gmail.com
Deptt.of Physics, Mahatma Fule Arts, commerce and Sitaramji Chaudhari Science Mahavidiyala Warud-444906. ystamgadge@gmail.com
Deptt.of Chemistry Mahatma Fule Arts, commerce and Sitaramji Chaudhari Science Mahavidiyala Warud-444906.
rajuganorkar100@gmail.com
reenabakale123@gmail.com

Abstract

The electrical conduction mechanism of iodine doped polyvinyl chloride (PVC) - polymethyl methacrylate (PMMA) blend film has been studied by finding the I-V characteristics at various temperatures in the range of 313K-393K. Analysis has been made in the light of Poole-Frenkel, Fowler-Nordheim, Schottky, ln(J) versus T plots, Richardson and Arrhenius plots. It has been observed that Schottky and Richardson's mechanism is mainly responsible for the conduction in the sample film. The activation energy for conduction has been found to be 0.13 eV.

Keywords: Polyvinylchloride (PVC), Polymethyl-methacrylate (PMMA), blend film, conductivity

PMS-23

OPTIMIZATION OF PROCESS PARAMETERS FOR THE GREEN SYNTHESIS OF SILVER NANOPARTICLES USING PLACKETT-BURMAN AND 3- LEVEL BOX- BEHNKEN DESIGN

HARSHA SONAYE, VIDYA SABALE AND PRAFULLA SABALE

Dadasaheb Balpande College of Pharmacy
harshasonaye12@gmail.com

Abstract

In this study optimization process variables for the green synthesis of silver nanoparticles (AgNPs) from extract of Gloriosa Superba was carried out by two chosen statistical models Plackett Burman design (PBD) and Box- Behnken Design (BBD) the phytochemical components in extract play a vital role in reducing the AgNO3 and synthesizing AgNPs during reduction process, several factors which affect the synthesis of nanoparticles have been found to be pH, temperature, pressure, time of reaction , microwave radiation exposure time, UV radiation exposure time, concentration of plant extract, concentration of silver nitrate and sunlight exposure time A mathematical model was developed to correlate the interactive influence of the parameters and the significant reduction Plackett Burman design (PBD) indicated that concentration of plant extract , concentration of silver nitrate and sunlight were the major parameters affecting the synthesis of silver nanoparticles The mutual interaction of these variables were mapped in the design by 3 - level Box-Behnken Design (BBD) The significant factors and their interactions in the green synthesis were examined by analysis of variance (ANOVA) The result indicated that the BBD was a good predictive model for the experimental results Satisfactory yields were obtained of AgNPs using optimum conditions as compared to conventional synthesis of nanoparticles. Nanoparticles synthesized under optimized conditions from plant extracts when characterized showed uniform size and shape I e, spherical shape and size

Keywords: Optimization, Silver Nanoparticles, Green Synthesis, Plackett Burman design (PBD), by 3 - level Box- Behnken Design (BBD)

PMS-24

THEORETICAL INVESTIGATION ON MECHANICAL AND ULTRASONIC PROPERTIES OF EPITAXIAL NANOSTRUCTURED ZRN LAYERS GROWTH ON MGO (001) SUBSTRATE

AADESH K. PRAJAPATI*, PRAMOD K. YADAWA**

Department of Physics,
Prof. Rajendra Singh (Rajju Bhaiya) Institute of Physical Sciences for Study and Research, V. B. S. Purvanchal University,
Jaunpur, India- 222003
Email: *aadeshbhu83@gmail.com, **pkyadawa@gmail.com

Abstract

In the present paper, we have calculated the elastic, mechanical and thermophysical properties of ZrN/MgO (001) nanostructured in the temperature range 50 -300K using higher order elastic constants. With two fundamental factors, nearest-neighbor distance as well as hardness parameter, in this temperature range, the second and third order elastic constants (SOECs and TOECs) are estimated using the Coulomb & Born-Mayer potential. The computed values of SOECs have been used to calculate Young's modulus, thermal conductivity, Zener anisotropy, bulk modulus, thermal energy density, shear modulus as well as Poisson's ratio in order to assess the thermal and mechanical properties of ZrN/MgO (001) nanostructured layer. Additionally, the SOECs are used to calculate the wave velocities for shear as well as longitudinally modes of propagation along crystalline orientations <100>, <110>, &<111> in these temperature range. Temperature dependent Debye average velocity, hardness, melting temperature and ultrasonic Grüneisen parameters (UGPs) have been evaluated. The fracture/toughness (B/G) ratio in the current investigation is more than 1.75, indicating that the ZrN/MgO (001) nanostructured layer is ductile in nature in this temperature range. The selected materials fully satisfy the Born mechanical stability requirement. In this ambient temperature, it has been computed how long thermal relaxation takes to complete as well as how ultrasonic waves are attenuated by thermo-elastic relaxation as well as phonon-phonon interaction mechanisms. For industrial applications, the findings with other well-known physical features are helpful.

Keywords: Nanostructured layers, Elastic properties, Thermal conductivity, Ultrasonic properties

PMS-25

STUDY OF MECHANICAL PROPERTIES OF AL^{3+}SUBSTITUTED LITHIUM-MAGNESIUM FERRITE SYNTHESIZED BY SOL-GEL COMBUSTION METHOD

GAUTAM C. WAKDE[1], VIJAY R. RAGHORTE[1], ANAND S. KAKDE[2*], RAJU M. BELEKAR[3], ROHIT K. MAHADULE[4]

[1]Department of Physics, Narayanrao Kale Smruti Model College, Karanja, Wardha 442203, (MS) India, gautam.wakde@gmail.com, sveer26@gmail.com
[2]Department of Physics, Amolakchand Mahavidyalaya, Yavatmal 445001, (MS) India, anandkakde85@gmail.com
[3]Department of Physics, Government Institute of Science, Nagpur 440001, (MS) India, rajubelekar@gmail.com
[4]Department of Physics, S. Chandra Mahila Mahavidyalaya, Sadak-Arjuni, Gondia 441807, (MS) India, nodoubt.mahadule@gmail.com

[*]Corresponding Author: Dr. Gautam Wakde gautam.wakde@gmail.com, Dr. Anand Kakde anandkakde85@gmail.com

Abstract

A series of aluminum (Al^{3+}) substituted Lithium-Magnesium (LMA) Spinel ferrites with general chemical formula $Li_{0.5(1-x)}Mg_xFe_{2.5-y}Al_{y-0.5x}O_4$ with x = 0.1 and y = 0.2 (LMA1), 0.4 (LMA2), 0.6 (LMA3) and 0.8 (LMA4) were prepared by using citrate sol-gel combustion method. Elastic properties of Al^{3+} substituted Li-Mg (LMA) Spinel ferrites were studied. The elastic parameters, stiffness constant (C_{11}), elastic wave velocity (V_m), bulk modulus (B), Young's modulus (E), rigidity modulus (G), Poisson's ratio (P), and Debye temperature (θ_D) were obtained from Fourier Transform Infrared Spectroscopy (FT-IR) data.

Keywords: Sol-Gel Combustion Method, Spinel ferrite, FT-IR, Stiffness Constant, Debye temperature.

PMS-26

BISMUTH DOPED GDOF PHOSPHOR: TRANSITION METAL ION PHOTOLUMINESCENCE

SUMEDHA TAMBOLI[a]*, GOVIND B. NAIR[a], S. J. DHOBLE[b], H. C. SWART[a]

aDepartment of Physics, University of the Free State,
P. O. Box 339, Bloemfontein, 9300, South Africa
bDepartment of Physics, R.T.M. Nagpur University,
Nagpur, 440033, India
Corresponding Author: *sumedhatamboli@yahoo.com

Abstract

Bi3+ ion shows broad photoluminescence in the visible region when incorporated in a suitable host owing to its 1S0 ↔ 3P1 electronic transition. Oxyfluorides were found to have low phonon energies, which reduces the possibility of non-radiation transition, and hence doping Bi3+ in GdOF can give good photoluminescence properties. GdOF:Bi3+ phosphors were synthesized by microwave synthesis and their structural characterization was done obtaining X-ray diffraction pattern. The material shows blue luminescence centred at 430 nm when excited with a 325 nm laser. A comparative study of photoluminescence properties of the phosphors is presented by changing doping concentration and host ions.

Keywords: Bi3+, transition metal ion photoluminescence, microwave synthesis

PMS-27

BIOCHEMICAL COMPONENTS IN FRESHWATER BIVALVE MOLLUSCS, LAMELLIDENS CORRIANUS

SANGEETA B. DONGRE, PRIYANKA SHEJWAL AND SUHASINI GEDEKAR

Assistant Professor, Dept. of Zoology
Government College of Arts and Science Aurangabad,, Maharashtra State, India.431001.
Email: sangeetadongre24@gmail.com

Abstract

Biochemical composition in Lamelliden corrianus, the freshwater species collected from Nanadrabad Pond near Khultabad, Aurangabad district, varied seasonally. An inversely correlation with the protein and lipid constituents was observed during the summer and winterseason. The fluctuation in biochemical content might be due to the impact on the endogenousand exogenous factors and the triggering role of cerebral ganglion ablation.

Keywords: Biochemical, Lamelliden corrianus, Cerebralectomy, Protein and lipid content.

PMS-28

UNIQUE OPTO-ELECTRONIC PROPERTIES OF ORTHORHOMBIC POLYCRYSTALLINE SBSEI

HARISH K. DUBEY 1 , ARCHANA SINGH 2 , MADHURI SHARON 3

1 Department of Physics, B. K. Birla College (Autonomous), Kalyan, M.S., India
2 Department of Chemistry, B. K. Birla College (Autonomous), Kalyan, India
3 Department of Energy System, MNIT, Jaipur, India

Abstract

Needle shaped shiny polycrystalline SbSeI was grown by Solid State Thermal Reaction ofconstituent elements taken in stoichiometric ratio in an evacuated quartz tube at 585 o C for3.5 hours. The obtained compound was characterized by SEM, EDAX and XRD techniques. The resistance vs. temperature curve exhibits semiconducting nature of the compound withresistivity of 3.5 x 10 7 Ω-cm, activation energy for electric conduction of 1.93 eV anddielectric constant 10434. A photoconductive trait of the compound was studied in the visibleregion. It is evident that the compound has more absorption for green light (520 nm to 560nm) which is in agreement with the UV-VIS absorption data. The optical band gap was foundto be 1.65 eV.

Keywords: SbSeI, Solid State Thermal Reaction, Resistivity, Activation Energy, Photoconductive, Band-gap.

PMS-29

STUDY OF THERMAL PARAMETER OF POLYANILINE-PBS NANOCOMPOSITE USING DTATECHNIQUE.

D.P. MEGHE 1, J. B. BHAISWAR 2, N.MESHRAM 3, S. P. DONGRE 4, MR.KINGE5

1 Department of Physics, Nagpur Institute of Technology, Nagpur
2 Department of Physics, Nagpur Institute of Technology, Nagpur
3 Department of Physics, Dr. Ambedkar College, Nagpur
4 Department of physics, Bhalerao Science College Saoner
Email-jitendrabhaiswar@gmail.com,

Abstract

DTA thermal analysis indicated that the Polyaniline powder had discerniblemoisture content. This phenomenon was in agreement with the TGA results. Moreover, in thefirst run of DTA thermal analysis, an exothermic peak at 150-310 o C was found. This peak wasdue to the chain cross linking, resulting from a coupling of two neighboring -N=Q=N- groups togive two -NH-B-NH groups through a link of the N with its neighboring Quindío ring. Thus, onthe basis of thermal profile of these materials, we can say that among all composite material, thePANI/PbS composite materials, cross-linking or oxidative reaction starts at higher temperature, which indicates that the thermal stability of PANI/PbS nanocomposites is higher.

Keywords: DTA, thermal analysis, Polyaniline, Pbs, nanocomposite

PMS-30

BIOLOGICAL FRACTALS AND MORPHOLOGICAL CHANGE IN BACTERIAL COLONIES

KRANTI ZAKDE1, NAZNEEN AKHTAR2, SUREKHA MUNDE3, PRADNYA INGLE4, YUSUF H SHAIKH5

Corresponding author: drpradnyaingle@gmail.com

Abstract

The collection of patterns and shapes in nature has long been a source ofjoy and wonder to laymen and scientists alike. Discovering how such patternsemerge spontaneously from an orderless and homogeneous environment hasbeen a challenge to researchers in the natural sciences throughout the ages. Manyphenomena display the emergence of patterns during diffusive growth, rangingfrom the growth of snowflakes to solidification of metals, from the formation of acoral reef to cell differentiation during embryonic development. Alan Turingunderstood that patterns would evolve in systems driven out of equilibrium, where competition and interplay between various tendencies exists. We realizedthat the diffusion field drives the system towards decorated (on many lengthscales) irregular fractal shapes.

Here we describe cooperative patterning during growth of bacterialcolonies a standard modelling approach was developed by combining a detailedstudy of the cellular behaviour and dynamics during colonial development andinvoking concepts derived from the study of pattern formation in non-livingsystems.

Keywords: fractal, fractal shapes, diffusion, bacterial colonies etc.

PMS-31

ON PROMISING APPLICATIONS OF CUO-RGO COMPOSITE IN THE REDUCTION OF NITROAROMATICS AND DEGRADATION OF METHYLENE BLUE WITH STATISTICAL ANALYSIS FOR IDENTIFYING BEST CATALYST WITH MINIMUM REACTION TIME

GAYATRI PANDEY1, NITESH RAJPUT1, HEMANT KUMAR DAIMA1, NARENDRA PAL LAMBA1, MAHESH KUMAR SAINI1, JAGDISH PRASAD1, MANMOHAN SINGH CHAUHAN1*

1 Amity University Rajasthan, Jaipur, India-303002
gayatripandey9896@gmail.com

Abstract

In the present work, the nanocomposites of Nickel, Silver, Copper oxide with Graphene Oxideare prepared. The characterization of these nanocomposites are done using Fourier-transform Infrared Spectroscopy(FTIR), PowderX-ray Diffraction(PXRD), Thermogravimetric Analysis(TGA). Scanning Electron Microscope(SEM) is used to study the surface morphologyof these nanocomposites. A comparative study in the catalytic activity of these nanocompositesis performed on nitroaromatics and the results are statistically analysed using univariate analysisof variance and Post Hoc Test through Statistical Package for Social Sciences(SPSS) and it wasfound that amongst the three catalyst the Graphene oxide-Copper oxide composites is showingbetter catalytic activity with 100% reduction in minimum time. Dye degradation of Methyleneblue is also performed using Graphene oxide-Copper oxide nanocomposite and using UVspectroscopy, the degradation is confirmed. Percentage of degradation 100 percent or lamdamax.value 380 nm.

Keywords: Nanocomposites, Catalysis, Nitroaromatics, Graphene Oxide, Dye degradation, Fullfactorial experiment, Univariate ANOVA, Post-Hoc Test

PMS-32

MICROWAVE HYDROTHERMAL PREPARATION OF NIO-MOO3/GO HETEROSTRUCTURE FOR PHOTOCATALYTIC ACTIVITY THROUGH S-SCHEME MECHANISM

DHANANJAY PURUSHOTHAM, a ABHILASH MAVINAKERE RAMESH, a, b ANJU KODANDARAM, b AND SRIKANTASWAMY SHIVANNA a, b*

aCentre for Materials Science and Technology, Vijinana Bhavan, University of Mysore, Manasagangotri, Mysore - 570 006, India
bDepartment of Studies in Environmental Science, University of Mysore, Manasagangotri, Mysore - 570 006, India
* Corresponding author e-mail: srikantas@hotmail.com
(Srikantaswamy Shivanna)

Abstract

An environmentally benign, economically advantageous microwave hydrothermal approach is used to synthesize desirably tailored NiO-MoO3/GO heterostructure. In this work, the synthesized novel ternary heterostructure photocatalyst characteristics were examined using a number of analytical techniques to understand complete morphology and function. The Step scheme (S-scheme) charge migration approach was used to describe the process. An improved photocatalytic activity of nanocomposites primarily attributed to the development of heterostructure morphology, the construction of p-n type semiconductor junctions between NiO and MoO3, effective charge recombination capacity, high surface area, and extended photo response to the degradation of Victoria blue-B (Vb-B) dye. Results from reactive radical-scavenging experiments and electron spin resonance showed that hydroxyl and oxide active species. Evaluations of ultraviolet photoelectron spectroscopy, band positions and a potential photocatalytic process were all thoroughly examined in S-scheme mechanism. Measured electron transport transfer between NiO and MoO3 yielded work functions of 6.32 eV and 5.26 eV, respectively. The cell apoptosis of HeLa cell line is used to assess the materials biocompatibility. We anticipate that our results will pave the way for current and future applications.

Keywords: Henrietta Lacks, Photocatalytic degradation, S-Scheme mechanism, Work function, and Victoria blue-B.

PMS-33

UPCONVERSION LUMINESCENCE IN HO^{3+}/YB^{3+} DOPED SR_2YF_7 PHOSPHOR FOR BIOMEDICAL APPLICATIONS

KAPIL S. JANBANDHU[1,2]*, V.B. PAWADE[1], S.J. DHOBLE[2]

[1]Department of Applied-Physics, Laxminarayan Institute of Technology, Nagpur-440033, India
[2]Department of Physics, R.T.M. Nagpur University, Nagpur-440033, India
*Corresponding author kapiljanab@gmail.com

Abstract

Alkali-earth–rare-earth complex fluoride materials, Sr_2YF_7: Ho^{3+}/Yb^{3+} upconversion phosphor are prepared by wet chemical method. X-ray diffraction (XRD) study revealed that the as-synthesized upconversion phosphors are of tetragonal structure with pure phase. The upconversion luminescence spectra is recorded by using 980 nm laser source. The emission bands are observed at 404 nm, 435 nm, 488 nm, 542 nm, 645 nm, 653 nm, and 750 nm corresponds to $^5G_4 \rightarrow {}^5I_8$, $^5G_5 \rightarrow {}^5I_8$, $^5F_3 \rightarrow {}^5I_8$, $(^5F_4 + {}^5S_2) \rightarrow {}^5I_8$, $^5F_3 \rightarrow {}^5I_7$, $^5F_5 \rightarrow {}^5I_8$ and $^5I_4 \rightarrow {}^5I_8$/ $(^5F_4 + {}^5S_2) \rightarrow {}^5I_7$ transitions of Ho^{3+} ions respectively. The upconversion luminescence mechanism analysis indicates that the energy-transfer from Yb^{3+} to Ho^{3+} is ascribed to the two and three photon absorption process.

Keywords: Upconversion, ETU, Sr_2YF_7: Ho^{3+}/Yb^{3+}

PMS-34

FABRICATION OF ELECTRODES COATED WITH CARBON NANOTUBES TO REMOVE POLLUTANT IN TREATED WASTEWATER

AKSHATHA GANGADHAR, a ABHILASH MAVINAKERE RAMESH, b DHANANJAY PURUSHOTHAM b AND SRIKANTASWAMY SHIVANNA a, b**

a Department of Studies in Environmental Science, University of Mysore, Manasagangotri, Mysore 570 006, India
b Centre for Materials Science and Technology, Vijinana Bhavan, University of Mysore, Manasagangotri, Mysore 570 006, India
** Corresponding author e-mail: srikantas@hotmail.com (Srikantaswamy Shivanna).

Abstract

Toxic Pollutants are in micro quantity having environmental risk due to their bioaccumulation remains even after the wastewater treatment. They remain untreated even after secondary treatment with 40% of high frequency detection and also during tertiary treatment with 23% high frequency detection, and secondary treatment with 40% of high frequency detection therefore it leads to risk of specific chronic effects. Hence, more research works are needed to eliminate these Pollutants in micro quantity. In this regards, Carbon nanotubes (CNT) have been successfully used to remove the Pollutant remain in micro quantity by electrochemical treatment. This work is the first attempt in this direction. CNT are prepared by Chemical Vapor Deposition (CVD) method and CNT have been coated on anode electrode. The Characterization of the synthesized materials have been carried out with advanced techniques namely X-Ray Diffraction (XRD) , Dynamic Light Spectroscopy (DLS), Energy Dispersive Spectroscopy (EDS), X-ray Photoemission Spectroscopy (XPS) to confirm crystallinity, size, composition of the elements, and purity respectively. Statistical analysis of variance (ANOVA) has carried to confirm the efficiency. Three independent variables like pH, voltage, and Dosage are selected and the R2 value obtained have been ranged of 0.6 to 0.8, Response Surface Methodology (RSM) is adapted to achieve high efficiency of CNT. Hence CNT have been efficiently remove the Pollutants in micro quantities in waste water after conventional waste water treatment and the removal pollutants and on further analysis shows that pollutant ranged between 82.992 to 91.472 %.

Keywords: Carbon nanotubes, CNT-based electrode, Electrochemical Treatment, Pollutants, Wastewater Treatment.

PMS-35

UNDERSTANDING OF PHOTOLUMINESCENCE PROPERTIES OF EUROPIUM DOPED $SR_2AL_2SIO_7$

TRIPTI RICHHARIYA1, NAMEETA BRAHME2¬, D. P. BISEN2

1Department of Physics,
Kalinga University,
Naya Raipur India-492101
2SoS in Physics and Astrophysics,
Pt. Ravishankar Shukla University,
Raipur, India-492010
Corresponding author emails: triptirichhariya21@gmail.com, namitabrahme@gmail.com

Abstract

In this study series of trivalent europium doped Sr2Al2SiO7 (SASO) phosphors have been done via conventional solid-state reaction method. For structural characterization X-ray powder diffraction pattern is done, which suggest the phase formation of desired phosphors. Photoluminescence (PL) studies have also been performed for the optical studies of synthesized phosphors. The PL studies reveals that the optimum intensity is obtained at 3 mol% doping concentration of Eu3+. Chromaticity co-ordinates and correlated color temperature for the optimized concentration is calculated and compared with the commercial red phosphors i.e., Y2O3:Eu3+and it is observed that the experimental parameters are too close to the parameters of the commercial phosphor. This reveals that the synthesize phosphors may act as potential candidate for the development of red light. Further, to study the transition probabilities of forbidden transition of rare earth ions, Judd Ofelt analysis for optimized concentration have also been studied.

Keywords: Photoluminescence, Eu3+, XRD, CIE co-ordinates

PMS-36

LI2SRSIO4: SM3+ PHOSPHOR AGAINST UV-C RADIATION FOR DOSIMETRY APPLICATION : INVESTIGATION OF THERMOLUMINESCENCE RESPONSE AND KINETIC PARAMETERS

KANCHAN TIWARI1, B. G. SHARMA1, TRIPTI RICHHARIYA2, EKTA CHANDRAWANSHI2, NAMEETA BRAHME3, D. P. BISEN3.

1Govt. Nagarjuna P.G. College of Science, Raipur, India.
2Department of Physics, Kalinga University, Raipur (C.G.)-492101, India.
3SoS in Physics and Astrophysics, Pandit Ravishankar Shukla University, Raipur, India.
Email of corresponding author – tiwarikanchan457@gmail.com

Abstract

A series of trivalent Samarium activated Li2SrSiO4 were synthesized using solid state reaction method and their thermoluminescence (TL) characterization and kinetic parameters against 254 nm (UV-C radiation) was carried out in this work. The powder X-ray diffraction (PXRD) tool was used for the confirmation of phase formation of the prepared phosphor. Ultraviolet (UV) radiations are castoff in a diversity of applications such as health related therapy, sterilisation and polymerisation of dental fillings. Excessive exposure to ultraviolet radiations is harmful and it needs to be monitored for appropriate applications. TL results depict that the optimum intensity was obtained at 1 mol% doped Li2SrSiO4:Sm3+ phosphor. The glow curve exhibited a broad peak centred at 505 K. The location and the shape of the glow curve were not influenced by the increment in dose, which is one of the requirements for dosimetry application. TL response curve was studied and showed a linear behaviour against the studied dose (10–35 min). The effect of different heating rates on the TL intensity and the position of the glow peak were discussed in detail. In addition to this, the detailed examination of the glow peaks using variable heating rate, atmospheric conditions, fading after irradiation and reproducibility was done to reveal the trapping parameters and to check the suitability of the present phosphor for UV-C dosimetry application.

Keywords: - Dosimetry, trap distribution, fading, UV dosimetry, reproducibility.

PMS-37

SYNTHESIS AND SPECTROSCOPIC INVESTIGATION OF NOVEL EU^{3+} DOPED NA_2LIALF_6 FOR SOLID STATE LIGHTING APPLICATIONS.

SANKET J. HELODE*, ABHIJEET R. KADAM AND S. J. DHOBLE

Department of Physics, R. T. M. Nagpur University, Nagpur-440033, India
*Corresponding author: helodesanket631@gmail.com

Abstract

Luminescent properties of Rare earth activated inorganic compounds are most investigated due to its excellent luminous efficiency, high chemical and thermal stability as well. In this paper we report the novel Na_2LiAlF_6 luminescent host material activated with Eu^{3+} rare earth ions. The proposed luminescent material is synthesized by the low temperature wet chemical method. The material was given thermal treatment of 300° for 24 hrs during the synthesis which is considerably lower than many other synthesis methods such as solid-state diffusion method, sol gel method, combustion method, etc. The synthesized phosphor was characterized by XRD (X- ray diffractometer) for the analysis of phase purity and structural confirmation. Optical properties of the material were studied briefly with the inclusion of excitation and emission spectral studies. The study was carried out by photoluminescence spectrometer under the maintained atmosphere of temperature 38°C which is probably the room temperature. In the PL investigations excitation band is observed in the range of 350 nm to 550 nm range having intense peaks due to the major transitions in between $^7F_0 - {}^5L_6$ and $^7F_0 - {}^5D_1$. Whereas the emission band is observed in the range of 570 nm to 640 nm having two peaks due to $^5D_0$ to $^7F_1$ and $^5D_0$ to $^7F_2$ transitions. Effect of concentration quenching studied briefly. CIE color coordinates have been calculated by Color calculator software and identified as coordinates are approximately near the NTSC coordinators of red emitting phosphors. Color purity obtained from the calculations for the analysis of phosphor having emission in red region and Color temperature has also been calculated for the prepared phosphor which demonstrates that the prepared red emitting phosphor is useful in various device applications such as phosphor converted White light emitting diodes (PC- WLED's), solid state lighting, display technology etc. thus this article briefly discuss about the synthesis methods and optical properties of novel Na_2LiAlF_6 activated with the Eu^{3+} rare ions and their possible applications.

Keywords: Photoluminescence; lamp phosphor; WLED; XRD; Wet-chemical

PMS-38

SYNTHESIS AND LUMINESCENCE INVESTIGATION OF RED EMITTING CAALSIO$_4$F; EU^{3+} PHOSPHOR FOR WLEDS APPLICATIONS

RAHUL V. TIKALE*, ABHIJEET R. KADAM, AND S. J. DHOBLE

Department of Physics,
R. T. M. Nagpur University,
Nagpur-440033, India
*Corresponding author: rahultikale480@gmail.com

Abstract

In the present study, the series of Eu^{3+} doped of $CaAlSiO_4F$ red emitting phosphor for different concentration was successfully synthesized by using high temperature solid state diffusion method. The phase identification of the prepared phosphor was recorded by using x-ray diffraction (XRD). In PL study, the emission peak of prepared phosphor located at 595 nm and 618 nm due to $^5D_0 \rightarrow {}^7F_1$ and $^5D_0 \rightarrow {}^7F_2$ transition at excitation 257 nm, 395nm and 465 nm. Commission de I Eclairage chromaticity (CIE) coordinates were analysed based on the PL emission spectra of the series $CaAlSiO_4F$: Eu^{3+} activated phosphor. All These results indicate that the $CaAlSiO_4F$: Eu^{3+}products have great potential applications for WLEDs.

Keywords: WLEDs; solid state diffusion; Lamp phosphor; XRD; SEM.

PMS-39

APPLICATION OF EU^{3+} DOPED $BI_4SI_3O_{12}$ PHOSPHOR FOR GREEN HOUSE FARMING

EKTA CHANDRAWANSHI[a], D.P.BISEN[b], NAMEETA BRAHME[b]

[a]Department of Physics,
Kalinga University,
Raipur C.G. 492010, India
[b]School of Studies in Physics and Astrophysics,
Pt. Ravishankar Shukla University,
Raipur C.G. 492010, India

Abstract

Light plays an important role in plant growth, because it exerts a vast range of effects on photosynthetic activity and photomorphogenic responses throughout the plant's life which in turn effects the growth rhythm of natural plants. In present work we reported on Eu3+ doped red light emitting Bi4Si3O12 (BSO) phosphor for spectroscopic implication in plant growth lightning. Eu3+ activated series of Bi4Si3O12 phosphor have been prepared via traditional solid-state reaction method. Crystal structure and phase structure characterization is determined by using X-ray diffraction (XRD). Photoluminescence spectra of Eu3+ doped Bi4Si3O12 phosphor were efficiently excited in the range of 200-550nm, prepared phosphor under 395 nm excitation shows main emission peaks sited at 581nm, 590 nm, 622 nm, 653 nm and 702 nm with corresponding transitions. The optimal Eu3+ doping concentration observed at 3mol%. PAR spectral requirement for plant growth is basically classified into blue light 450 nm (410-500 nm) which affects photosynthesis, red light 660 nm (610-700 nm) useful for phototropism and far-red light around 730 nm (700-740 nm) promotes photomorphogenesis. Observed emission peaks at 622 nm, 653 nm and 702 nm were chosen opt for plant grow lights. The absorption spectrum of phytochrome PFR is well match with emission band of our Eu3+ doped BSO phosphor and can be used as potential candidate for red emitting phosphor solid state lightning and plant grow light LEDs.

PMS-40

COMPARATIVE STUDIES OF LUMINESCENCE PROPERTIES OF TRIVALENT EUROPIUM DOPED GARNET PHOSPHORS

ANITA VERMAA, RAVI SHARMAB, D. P. BISENA, NAMEETA BRAHMEA, KAMLESH THAKKARA

a SoS in Physics and Astrophysics, Pt. Ravishankar Shukla University, Raipur (C.G.) 492010 India
b Department of Physics, Govt. Arts and Commerce Girls College, Devendra Nagar, Raipur (C.G.) India

Abstract

Eu3+ doped garnet phosphor was synthesized by two methods: sol gel and green synthesis method. In green synthesis method concentrated tamarind juice was used as a fuel. Phase identification was done by X-ray diffraction analysis and verified by matching with JCPDS file. Structural studies by XRD analysis, morphological studies by field emission scanning electron microscopy (FESEM) and photoluminescence studies for the samples synthesized by both the methods were compared and PL intensity found higher for the sample prepared by green synthesis method. Emission peak at 592 nm was found for Eu3+ doped garnet phosphor when excited at 394 nm. The CIE diagram was compared by both the samples.

Keywords: Phosphor, Green Synthesis, Photoluminescence, Thermoluminescence, XRD, FESEM, EDS

PMS-41

CHITOSAN TEMPLATED CE-DOPED MESOPOROUS TITANIA FOR METHYL ORANGE PHOTOREDUCTION

MEENALV. JOSHIA *, SADHANA S. RAYALUB

a: Ramdeobaba College of Engineering and Management, Katol Road, Nagpur-441513 (M.S.)
b: CSIR-National Environmental Engineering research Institute, Nehru marg, Nagpur-440020(M.S.)
E-mail: meenal5125@gmail.com

Abstract

Photocatalytic degradation of pollutants for environmental remediation is the thrust area due to continuous increase in the rate of global pollution. Photocatalysis is the cleaner and greener approach as it leads complete mineralization of pollutants in the presence of light and photocatalyst. TiO2 being most efficient and stable photocatalyst studied so far was synthesized via templating route. Efforts are being made towards replacing noble metals with rare earth therefore TiO2 is doped with rare earth metal Ce. The synthesized photocatalyst appears as yellow ochre in colour and visible light activity was substantiated by UV-Vis Diffused reflectance spectroscopy (UV-Vis DRS). UV-Vis-DRS shows λmax value in the range of 465nm. Band gap value for the same is in the range of 2.66 eV. The synthesized photocatalyst was also characterized for BET surface area, pore volume and pore size. The average surface area is 130m2/g, total pore volume 0.1778 cm2/g and average pore size is 49.86 Ao.

The as synthesized photocatalyst when employed for Methyl orange photoreduction reaction, it showed complete removal of dye on illumination with tungsten filament lamp of intensity 400W and duration extended up to 6h. In initial 4 hours 51 % of dye gets removed. Same photocatalyst was also tested for photocatalytic water splitting reaction, showed encouraging results.

Keywords: Photocatalysis; dye dergradation; methyl orange; Titanium dioxide; rare earth doped TiO2

PMS-42

GREEN CHEMISTRY METHOD OF PREPARATION, CHARACTERISATION AND IMPEDENCE STUDIES OF Bi Doped BaTiO3

G.PRASAD[2] AND M.VITHAL[1]

1 Department of Chemistry,
2 Department of Physics,
Osmania University,
Hyderabad - 500 007, India
gudurup@gmail.com

Abstract

Nano powder of BaTiO3 doped with Bi is prepared by metathesis reaction. Stoichiometric amounts of potassium titanium oxalate and barium chloride (10%excess) are taken in aqueous solution. The solution is subjected to slow evaporation with constant stirring to obtain a solid precursor. This precursor is ground into fine powder in the presence of spectral grade acetone. The material thus obtained is heated AT 8000C in a muffle furnace in air to get a mixture of BaTiO3, KCl and unreacted BaCl2. This material is washed with double distilled water to obtain BaTiO3.IR Spectra of BaTiO3 is recorded by using KBr pellet which showed a strong band centered at 550 cm-1 and a second band starting at 450 cm-1 and reaching a point of maximum absorption beyond 300 cm-1. The powder X-ray diffractogram of doped BaTiO3 is recorded. The d-values are in good agreement with the JCPDS data. Therefore, these powder patterns were least square fitted using the software POWD to obtain the calculated d-lines and unit cell parameters. Schrrer formula is used to estimate the crystallite size of the prepared BaTiO3 powders. The electrical impedance and admittance measurements are done using Auto Lab PGSTAT30 impedance analyzer in the frequency region 100Hz-1MHz and temperature region 30oC to 300oC. Grain and grain boundary contributions to the electrical conductivity are estimated. The results obtained are discussed in terms of the grain size and oxygen vacancy contributions.

PMS-43

UNDERSTANDING ELECTROCOLORIC EFFECT OF NBT-ST USING DIFFERENTIAL IMPEDANCE ANALYSIS

A. RAJANI MALATHI, G.S.KUMAR AND G. PRASAD*

Department of Physics, Osmania University, Hyderabad, 500 007,
gudurup@gmail.com

Abstract

(1-x) Na 0.5 Bi0.5 TiO3- (x) SrTiO3 where x=0.05,0.10,0.15,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9 were prepared by solid state process. Pure NBT and ST were prepared using sol-gel technique and mixed to obtain (1-x) Na 0.5 Bi0.5 TiO3- (x) SrTiO3. Through the analysis of XRD, SEM, lattice parameters, crystal structure and microstructure of the samples were evaluated. The depolarization temperature (Td) and the Curie temperature (Tc) were determined by dielectric studies. Relaxor behaviors of the samples were interpreted by Curie Weiss law fittings. SrTiO3 control on polarization properties of NBT were identified through PE loops and piezoelectric measurements. Polarization and entropy variations of dipole orientations at different temperatures are estimated and correlated with phase transformations. The intragranual and intergranual responses on electrical properties of the ceramics were studied from impedance analysis. The change in the impedance with doping is calculated and related to the changes in resistance and capacitance of the samples. The conduction mechanism was assessed by the activation energies for conduction and relaxation.

Keywords: NBT, ST, Relaxor, polarization, conduction.

PMS-44

SPECTROSCOPIC INVESTIGATION OF $KBA_2(PO_3)_5:MN^{4+}$ ACTIVATED PHOSPHOR FOR SOLID STATE LIGHTING AND RED LIGHT EMITTING

Prashant N. Parale[1], Abhijeet R. Kadam[2], K. V. Dabre[1], S. J. Dhoble[2]*
[1]Department of Physics, Taywade College, Koradi, Nagpur, 441111, India
[2]Department of Physics, R. T. M. Nagpur University, Nagpur – 440033, India
*Corresponding author: prashantparale@gmail.com

Abstract

In the field of energy-efficient warm white light-emitting diodes (w-LEDs) illumination, thereis still a lot of interest in the development of an unique non-rare-earth oxide red phosphor withimpressive luminous performance and cheap cost. Non-rare earth Mn4+ is activated by KBa(PO3)5 glasses have been made in the proposed work using the melt quenching approach. Theproposed glass sample's XRD pattern has an amorphous character, yet its strongest peakmatches material from the common ICDD $KBa(PO_3)_5$ database. SEM support the created glassmorphology study. MN^{4+} activated glass exhibits red light emission peaks duringphotoluminescence studies under blue excitations. Additionally, when this glass sample isuniformly crushed and coated on a solar cell using the doctor blade method, the efficiency ofthe solar cell is increased compared to a blank solar cell. These samples' results demonstrate their value for applications such as WLEDs, improving solar cell efficiency, and smart windows.

Keywords: Mn4+ ion; melt quenching; XRD; lamp phosphor.

PMS-45

CONFIRMATION OF ENHANCEMENT OF POROSITY, PENNE ENERGY AND DIELECTRIC CONSTANT PARAMETERS USING MATHEMATICAL MODEL FOR L-VALINE DOPED POTASSIUM DIHYDROGEN PHOSPHATE (KDP) SINGLE CRYSTAL

VIJAY R. RAGHORTE1,A), GAUTAM C. WAKDE1, SHASHI PANDEY2

1Department of Physics, Narayanrao Kale Smruti Model College, Karanja, Wardha 442203, (MS) India
2 Department of Physics, G.H. Raisoni Institute of Engineering and Technology, Nagpur (M.S.)
*Corresponding Author: Vijay Raghorte (vijayraghorte65@gmail.com)

Abstract

Potassium Dihydrogen Phosphate (KDP) is newly developed ideal nonlinear optical crystal used for high-energy laser technology and optical electronic devices. Nonlinear optically transparent KDP crystal has been grown by solution as well as Seed Rotating Crystal (SRC) method. The crystal grown form solution methods have excellent transparency was confirmed by UV-visible spectrum which shows 87 % transmittance. The crystal grown by slow evaporation method shows good mechanical properties. The higher concentration of amino acid dopant increases the hardness value crystal. A mathematical tool was used for confirmation of porosity, penne energy and dielectric constant parameters. The porosity of grown crystal depends effectively on doping of amino acid. The Penn energy of grown crystal depends on doping of amino acid. Influences of LV decrease the value of ΔEp. Also interpreted that the influence amino acid decreases the dielectric constant ΔD

Keywords: Crystal Growth, Seed Rotation, UV-Vis NIR Spectral Analysis, Mathematical Model

PMS-46

DEVELOPMENT OF OF POLYMERMEMBRANE FOR HIGH TEMPERATURE PROTON EXCHANGE MEMBRANE FUEL CELLS

HORILAL NIRMALKAR[1, A)], SHRADDHA SHIRBHATE[1], AND S.A. ACHARYA[1, B)]

[1]Advanced Materials Research Laboratory, Department of Physics, R.T.M. Nagpur University, Nagpur-440033, M.S., India
a) horilal.nirmalkar1256@gmail.com

Abstract

Proton Exchange membrane fuel cell (PEMFC) is one of the leading technologies for power generation. Proton exchange membrane is the proton ion conductor and is the important component on which the efficiency and operating temperature depend. To overcome theproblems with traditionally used membranes, this study introduces highly stable nanocomposite membrane with an inorganic filler for high-temperature proton exchange membrane fuel cell (HT-PEMFCs) applications under anhydrous conditions. In this work, Polybenzimidazole-Sulphonated Graphene Oxide (PBI-SGO) nanocomposite membrane were prepared by dispersing SGO filler in PBI polymer matrix followed by acid doping for application. The structural study of PBI-SGO nanocomposite membrane was investigated by X-Ray Diffraction (XRD), Scanning Electron Microscopy(SEM) andFourier-Transform Infrared Spectroscopy(FTIR). The SEM analyses have proved the dispersion of SGO in nanocomposite membrane. Acid retention ability, proton conductivity was enhanced by introduction of SGO filler in PBI polymer matrix. The enhancement of these properties is related to the increased content of -SO_3H functional groups in the PBI-SGO nanocomposite membrane, increasing channel availability required for the proton transport. Electrochemical impedance spectroscopy (EIS) technique was employed for the measurements of proton conductivity of the nanocomposite membranesat the operating temperature range of 30°C to 200°C in the interval of 20 °C. The sulphuric acid doped PBI-SGO 6 wt.% nanocomposite membrane displayed the highest proton conductivity, with a value of 0.0247 S/cm at 180 ^oC. These results show that the PBI-SGO nanocomposite membrane has great potential to be applied as an alternative electrolyte material in HT-PEMFCs.

PMS-47

ELECTRICAL PROPERTIES OF GD & W CO-DOPED $LA_2MO_2O_9$ AS AN ELECTROLYTE FOR IT-SOFCS

SAURABH S. SHIWANKAR[1, a)], SMITA ACHARYA[1, b)] AND SHRADDHA SHIRBHATE[1]

[1]Advanced Materials Research Laboratory, Department of Physics, R.T. M. Nagpur University, Nagpur 440033, M. S., India
a) saurabhshiwankar96@gmail.com, b) saha275@yahoo.com

Abstract

In this attempt, Gd and W co-doped $La_2Mo_2O_9$ (LMX) has been synthesized by the modified sol-gel method. The effect of Gd and W co-dopant on pure LMX lattice has been studied successfully by X-Ray Diffraction. Rietveld refinement has been carried out to study the effect of co-dopant on local structural parameters. The results reveal that pure and co-doped LMX has a cubic structure with a $P2_13$ space group. The electrical performance of pure and Gd and W co-doped lanthanum molybdate ($La_2Mo_2O_9$) was investigated by electrochemical impedance spectroscopy. It has been observed that co-doping enhances oxy-ion conductivity as compared to pure LMX. $La_{1.7}Gd_{0.3}Mo_{1.7}W_{0.3}O_9$ (LMXG3) exhibits higher ionic conductivity i.e. $2 \times 10^{-2} Scm^{-1}$ at 650^oC compare to pure and other co-doped LMX. The study made known that Gd and W co-doped LMX system has possible to be used as a solid electrolyte for intermediate temperature solid oxide fuel cell (IT-SOFCs).

Keywords: Solid electrolyte, LAMOX, Ionic Conductivity.

PMS-48

Solubility Enhancement of Etravirine by Cyclodextrin Complexation

ANKUSH T HAKE, JAGRUTEE MADAME*, NISHIKANT A. RAUT

Department of Pharmaceutical Sciences,
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur -440033, India.
*Presenting Author email: jagrutee22@gmail.com

Abstract

Background: Now a days aqueous solubility is a major challenge faced by formulation scientist. The drug Etravirine (ETR) is an antiretroviral agent used in the treatment of HIV 1 is one of the drugs having poor aqueous solubility and poor permeability. Cyclodextrincomplexation is one of the widely used method for the enhancement of aqueous solubility of poorly soluble drugs. The aim of the study was to attain the enhancement of aqueous solubility of ETR by preparing cyclodextrin complexation and to access the permeability across the intestinal membrane.

Method: The β-CD inclusion complex was prepared by solvent evaporation method with 1:1 ratio of ETR/β-CD. Formation of β-CD inclusion complex were confirmed by evaluation of physicochemical characterization such as FTIR, PXRD, SEM, DSC by comparing the spectrum and thermograms of individual components and their physical mixtures.

Result: FTIR studies revealed that the N-H group of ETR is specifically involved in the interaction between ETR and each of the β-CD studied and formation of new supramolecular compound. PXRD studies showed that drug present in the cyclodextrin cavity. In SEM images revealed the change in the crystalline nature of ETR had diminished. DSC study confirmed complexation by change in melting point and sublimation point. In the *invitro* permeability study, it was observed that at the end of 3hrs study duration only about 12.9% w/w,20.79%w/w, and 31.70%w/w of pure ETR, physical mixture and complex respectively permeated through the everted intestine.

Conclusion: From the above data it is concluded that ETR-β-CD complexincreases the solubility by 11 folds. Hence the proposed method of solubility enhancement by forming β-CDcomplex of Etravirine can be prospective approach for improvement of aqueous solubility and bioavailability which provide cost effective.

PMS-49

ND 2 MNFEO 6 AS A PROSPECTIVE DOUBLE PEROVSKITE MATERIALS FOR ROOM TEMPERATURE MULTIFERROIC

N.N. DORLE 1* , S.C. SHIRBHATE 1 , S.A. ACHARYA 1

1 Advanced Materials Research Laboratory,
Department of Physics, RTM Nagpur
University, Nagpur-440033, India
*Nehadorle14@gmail.com

Abstract

Multiferroic materials exhibit more than one ferroic order in which ferromagnetic andferroelectric orders coexist. Double perovskite oxides, possessing electric and magnetic orderingsimultaneously, are of prime interest owing to their rich physics and technological applicationsin spintronics devices. Existence of multiferroic properties in single material and existence offerroic properties at room temperature are big challenges. Double perovskite oxides ofcomposition R 2 NiMnO 6 have accelerated intense research activities due to rich physics behindthem for the origin of multiferroicity. In the present work, we attempted to develop doubleperovskite Nd 2 MnFeO 6 as room temperature multiferroic. Nd 2 MnFeO 6 polycrystalline samplewas synthesized by a Sol Gel Combustion Technique. The structure is confirmed by X-raydiffraction technique and verified by Rietveld refinement. Monoclinic structure having P21/nspace group was confirmed. Microstructural features of the as-calcined powder exhibit non-spherical cylindrical shape particles having length varying between 150-200 nm that give moreinterest to study there dielectric and magnetic property in multiferroic. These results open aneffective avenue to explore magnetic multiferroics.

Keywords: Multiferroic, Ferroelectric, Spintronics, Double perovskite, Magnetics

PMS-50

SYNTHESIS AND CHARACTERIZATION OF CE DOPED COBALT FERRITES

[1]M. D. KHARBADE[1] A. R. BANSOD, [2]S. J. DHOBLE
1. Dr. Ambedkar College Deekshabhoomi Nagpur
2. Dept of Physics, RTM Nagpur University Nagpur
Corresponding author mail: manjulakharbade@gmail.com

Abstract

The use of cerium doped Cobalt Ferrite (CoFe2O4) in the production of contemporary electronic products, such as solar panels, capacitors, and batteries, has recently come under investigation. Consequently, a sector that could particularly profit from improved applications of such material is the field of solar-powered cars, which heavily depend on energy-efficient electronics for performance. In this study, cobalt nitrate hexahydrate, cerium nitrate, and iron nitrate nonahydrate were used as precursors and urea as fuel to study the solid-state reaction synthesis of cobalt ferrite. The nitrates were dissolved in distilled water and heated while stirring for five minutes. When the temperature reached 60°C, urea was added, and the mixture was thoroughly homogenised before being put inin microwave oven until complete combustion (approximately 05 minutes). Three syntheses were carried out using different concentrations of rare earth. The product crystallite size and composition were investigated in order to determine the influence of the rare earth concentration on the structure of the produced cobalt ferrite.

PMS-51

HEAT TRANSFER MECHANISM IN METAL ION SUBSTITUTED FERRITES

[1]B.T. KAPGATE, [1]A. R. BANSOD, [2]S. J. DHOBLE

1. Dr. Ambedkar College Deekshabhoomi Nagpur
2. Dept of Physics, RTM Nagpur University Nagpur

Corresponding author mail: bharati280499@gmail.com

Abstract

The design, fabrication, and characterisation of nano-materials have attracted a lot of interest since the physicochemical properties of nanophase materials are fundamentally different from those of their bulk counterparts and frequently display new or crossover phenomena. To increase their potential for use in heat transfer, much research is being done on nanofluids including metallic or nonmetallic nanoparticles such TiO2, Al2O3, Cu, CuO, Ag, and carbon nanotubes. They are colloidal suspensions of ferromagnetic metals (iron, cobalt, and nickel) and their oxides (ferrimagnetic materials), such as magnetite (Fe3O4) and ferrites (Mn-Zn, Co ferrites), in either polar or nonpolar liquid carriers. These magnetic fluids are a particular class of smart materials that can modify their physical characteristics in response to an applied magnetic field from the outside. We suggest maximising the factors that affect how ferrofluids and heat transfer properties develop. The effectiveness of enhancing current nanofluids with regard to heat exchange, particle size, base effect, etc.

PMS-52

SYNTHESIS AND PHOTOLUMINESCENCE STUDY OF $CA_7MG_2(PO_4)_6$: SM^{3+} PHOSPHOR FOR WHITE LEDS APPLICATIONS

PRAFUL P. KHODE*, SANKET J. HELODE AND S. J. DHOBLE

Department of Physics,
R. T. M. Nagpur University,
Nagpur – 440033, India
*Corresponding author : ppkhode14@gmail.com

Abstract

Orange-red light emitting $Ca_7Mg_2(PO_4)_6$: Sm^{3+} phosphors were synthesized by solid state diffusion method. The phase purity and luminescence properties of as prepared samples were investigated and discussed in detail. Under the 403 nm excitation, the $Ca_7Mg_2(PO_4)_6$: Sm^{3+} phosphor displayed four emission band due to the infra 4f-4f transitions of Sm3+ and the most intense one was at 600 nm. The estimated CIE coordinates (0.5136, 0.4851) lies in the orange-red region, with a high colour purity of 97.3%. Existing findings revealed that the $Ca_7Mg_2(Po_4)_6$:Sm^{3+} phosphor has promising potential for near UV-excited Led Application.

KEYWORDS: Orange-red light, Phosphor, Sm^{3+}, Solid State Diffusion

PMS-53

SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF RED LIGHT EMITTINGEU^{3+} DOPED NAAL$(PO_3)_4$GLASS

YASH D. NARAD*, TOSHI S. DHAPODKAR AND S. J. DHOBLE

Department of Physics,
R.T.M. Nagpur University,
Nagpur- 440033, India
*Corresponding author email: yashnarad230@gmail.com

Abstract

The present paper reports the newly synthesized Eu^{3+} doped $NaAl(PO_3)_4$ glass based phosphor using inorganic materials like sodium carbonate (Na_2CO_3), aluminium oxide (Al_2O_3), ammonium dihydrogen phosphate ($N_2H_9PO_4$) and europium oxide (Eu_2O_3). The sample was prepared by traditional Melt Quenching method. The sample was characterized by using techniques like X-Ray Diffraction (XRD), Scanning Electron Microscopy(SEM) Fourier-transform Infrared Spectroscopy(FTIR), photoluminescence (PL) and Commission Internationale de I'Eclairage (CIE). The PL emission was observed in the 500-650 nm range (red emissions). Sharp intense peaks were observed at 362, 394, 465 and 534 nm region with high intensity. The emission spectrum of Eu-ions consists of mainly similar wavelengths within 550-650 nm range, due to the transitions from the $^5D_0$ to $^7F_1$ and $^5D_0$ to $^7F_2$ energy levels of Eu ions. The present phosphor can act as a host for red light emissions in display devices like WLED's.

Keywords : Photoluminescence, Melt Quenching, Luminescent Glass, Phosphor, WLED.

PMS-54

RECENT ADVANCES IN SOLAR ENERGY SAVING MATERIALS

[1]NR. CHINCHKHEDE [1]A. R. BANSOD, [2]S. J. DHOBLE

1. Dr. Ambedkar College Deekshabhoomi Nagpur
2. Dept of Physics, RTM Nagpur University Nagpur
Corresponding author mail: nisargachinchkhede@gmail.com

Abstract

New prospects for the use of renewable energy resources are emerging as a result of growing global environmental concerns, rising energy demand, and ongoing advancements in renewable energy technologies. The most abundant, limitless, and cleanest source of renewable energy available today is solar energy. About 1.8 x 10^{11} MW of solar energy is intercepted by the earth, which is much more than the world's current rate of energy use. One of the best methods for using solar power is photovoltaic technology. This essay examines photovoltaic technology, as well as its ability to generate power, various light-absorbing materials now in use, environmental impact, and range of applications. We hereby reviewed various models currently used for evaluating performance and reliability, sizing and control, and grid

PMS-55

REVIEW ON PHOTOVOLTAIC (PV) MATERIALS: GLOBAL SCENARIO

[1]P. K. LAMBAT[2]A. R. BANSOD, [1]D. S. CHOUDHARI, [3]K. G. REWATKAR

1. Dept of Physics, D. B. Science College Gondia
2. Dr. Ambedkar College Deekshabhoomi Nagpur
3. Vidya Viaks College Samudrapur

Corresponding author mail: priteelambat@gmail.com

Abstract

The history, current situation, and potential future advances of photovoltaic (PV) materials for terrestrial applications are reviewed in this essay. Following a brief historical overview and explanation of the photovoltaic effect, it is described what conditions must exist for materials to perform at their best in pn-junction solar cells. Efficiency, long-term stability, and least expensive option are of utmost importance. Crystalline silicon, both in its multicrystalline and monocrystalline forms, currently dominates the market. The two deposition methods are either coevaporation on the one hand or separate deposition of the components followed by annealing on the other. Large area modules have reached 12% laboratory efficiency, while tiny area devices are getting close to 19%. In the US and Germany, CIS-module pilot production has begun. Solar cells made on cadmium telluride are also very promising. They are just beginning production and have a little lower efficiency. Other components and ideas are likely to be used in the future. Hereby we discussed the III/V-tandem cells, organic solar cells, dye-sensitized cells, and other concentrating systems.

PMS-56

PHOTOVOLTAIC MATERIALS, HISTORY, CURRENT SCENARIO AND FUTURE ASPECTS

[1]P. A. SHINGADE, [1]A. R. BANSOD, [2]K. G. REWATKAR

1. Dr. Ambedkar College Deekshabhoomi Nagpur
2. Vidya Viaks College Samudrapur

Corresponding author mail: shingade.pranali.ps@gmail.com

Abstract

The history, current situation, and potential future advances of photovoltaic (PV) materials for terrestrial applications are reviewed in this essay. Following a brief historical overview and explanation of the photovoltaic effect, it is described what conditions must exist for materials to perform at their best in pn-junction solar cells. Efficiency, long-term stability, and least expensive option are of utmost importance. Crystalline silicon, both in its multicrystalline and monocrystalline forms, currently dominates the market. The two deposition methods are either coevaporation on the one hand or separate deposition of the components followed by annealing on the other. Large area modules have reached 12% laboratory efficiency, while tiny area devices are getting close to 19%. In the US and Germany, CIS-module pilot production has begun. Solar cells made on cadmium telluride are also very promising. They are just beginning production and have a little lower efficiency. Other components and ideas are likely to be used in the future. Among these are III/V-tandem cells, organic solar cells, dye-sensitized cells, and other concentrating systems. Auger generation material and intermediate metallic band material are theoretical materials that have not yet been produced.

PMS-57

ANALYTICAL STUDY OF PHOTOCATALYTIC ACTIVITY FOR ZINC AND COBALT SPINEL FERRITES

[1]R. P. PANBUDE, [1]A. R. BANSOD, [2]K. G. REWATKAR

4. Dr. Ambedkar College Deekshabhoomi Nagpur
5. Vidya Viaks College Samudrapur

Corresponding author mail: rupalippanbude@gmail.com

Abstract

The current study documents the co-precipitation synthesis of rare earth doped MFe2O4 (M = Zn, Co) nanopowders and their photocatalytic activity. All of the powders were created under the same synthesis conditions so that their qualities could be compared. X-ray diffraction, scanning electron microscopy, UV-Vis diffuse reflectance spectra, and vibrating sample magnetometry were used to analyse their structures and characteristics. The outcomes demonstrated the creation of magnetic nanoparticles with a singlSe-phase spinel structure and a particle size of around 55 nm. Strong visible light absorption was detected in all of the samples. Nickel ferrite demonstrated the highest photocatalytic activity and dye adsorption among the examined nanopowders. After 2.5 hours of visible light irradiation of the dye over the ZnFe2O4 photocatalyst, the change in light absorption intensity reached 60%.

PMS-58

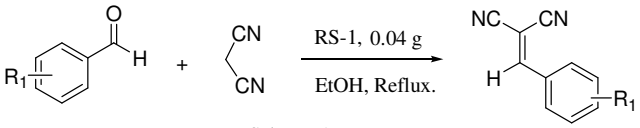
RUTHENIUM SILICATE (R-1) ZEOLITE: A NEW, AS AN EFFICIENT AND RECOVERABLE HETEROGENEOUS CATALYST FOR KNOEVENAGEL CONDENSATION

SACHIN P. GADEKAR[1], RAMDAS N. HUSE[2], NILAM D. BANSODE[2], MACHHINDRA K. LANDE[2]

[1]Sajivani Arts commerce and Science college Kopargaon,
Ahemadnagar (MS). India.
[2]Department of Chemistry, Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad. (MS), 431004, India.
Corresponding author-Tel: +91 0240 2403311; Fax: +91 0240 2403335.
mkl_chem@yahoo.com

Abstract

Ruthenium silicate zeolite catalyst was synthesized from tetraethyl ortho-silicate and ruthenium trichloride via simple co-precipitation method and hydrothermal technique and labeled as RS-1(Ruthenium silicate). The performed catalytic experiments revealed that RS-1 type zeolite catalyst had the high catalytic performance on the Knoevenagel condensation reactions, for instance, the conversion of 4-chlorobenzaldehyde and malononitrile into 2-(4-chlorobenzylidene)-malononitrile within a short reaction time."



Scheme 1.

Keywords: Ruthenium Silicate (RS-1), Zeolite, Solid acid catalyst, Heterogeneous, Knoevenagel condensation reaction.

PMS-59

BLUE AND GREEN EMISSION IN RARE EARTH ACTIVATED $BaAL_2SiO_6$ PHOSPHORS - POTENTIAL CANDIDATE FOR SOLID STATE LIGHTING

[1]M.M.KOLTE, [2]V.B.PAWADE, [3]S.J.DHOBLE

[1]Department of Physics,
Nutan Bharat Jr. College,
Nagpur-10, India
[2]Department of Applied-Physics,
Laxminarayan Institute of Technology,
Nagpur-33, India
[3]Department of Physics,
R.T.M. Nagpur University,
Nagpur-33, India

Abstract

White light emitting diodes (LEDs) has been proving a great revolution in solid state lighting as they are energy saving, environment friendly, reliable, small sized and show excellent performance such as short response time and high energy efficiency. Rare Earth doped inorganic phosphor has been the most popular approach to realise WLED because of their excellent luminescence properties. Rare earth ions have abundant energy levels from the UV to visible light due to their 4f–4f or 4f–5d transitions. Rare Earth activated aluminosilicates has received much attention due to their high chemical and thermal stability. Blue and green emitting Eu^{2+}, $Ce^{3+}$and Tb^{3+}activated novel $BaAl_2SiO_6$ phosphor has been synthesized by combustion synthesis method at 600°C.These phosphors show emission under near UV range, which may have potential application for solid state lighting.

PMS-60

SOLAR CELL EFFICIENCY ENHANCEMENT USING EU DOPED YITTRIA

[1]M. RAGHUWANSHI [1]A. R. BANSOD, [2]S. J. DHOBLE

1. Dr. Ambedkar College Deekshabhoomi Nagpur
2. Dept of Physics, RTM Nagpur University Nagpur

Corresponding author mail: manisharaghuwanshi61@gmail.com

Abstract

In a dye-sensitized solar cell, the europium-doped rare-earth oxide yttria (Y2O3:Dy3+) is added to the TiO2 film electrode. As a luminescent medium, Y2O3: Dy 3+ enhances the conversion luminescence process for better light harvesting and increases photocurrent; as a p-type dopant, Y2O3: Dy 3+ raises the energy level of the oxide film and boosts photovoltage. The efficiency of the cell's light-to-electric conversion is increased by a factor of 1.84 when the TiO2 electrode is doped with 4 weight percent of Y2O3: Dy 3+ as opposed to cells without the doping.

PMS-61

DEVELOPMENT OF ANALYTICAL METHOD AND STUDY OF SOLUBILITY ENHANCEMENT OF DRUG AND DETERMINATION OF ITS INTESTINAL PERMEABILITY

RUCHITA KELWADKAR, NISHIKANT RAUT, MADHURI NAKHATE

Department of Pharmaceutical Sciences,
RTMNU, Nagpur-440033, India
Corresponding author: kelwadkarruchi@gmail.com
nishikantraut29@gmail.com

Abstract

Background: Molecules with poor aqueous solubility and bioavailability are the major obstacles in formulation of efficient pharmaceutical products. So, the optimum solubility of active pharmaceutical ingredients is needed to improve bioavailability. Efavirenz is antiviral drug belongs to non-nucleoside reverse transcriptase inhibitor (NNRTI) which have lower solubility. This study is performed to enhance solubility of Efavirenz by analytical method development and by determination of intestinal permeability.

Method: The solubility of Efavirenz was enhanced by using solvent evaporation method which was performed by reducing the drug particle size at molecular level using various organic solvents. The method development was carried out by UV spectroscopy and RP-HPLC chromatography. In UV spectroscopy, absorbance of drug was recorded at 247 nm and In RP-HPLC, Efavirenz was run through C-18 column to study forced degradation study. The dissolution and permeation procedures were done to enhance intestinal permeability.

Result: The mixture of pure drug and polymer was responsible for interaction between drug and polymer via hydrogen bonding which ultimately enhance the solubility of drug, it was characterized by FT-IR, PXRD and SEM. Method is validated by UV which showed that Efavirenz can be used for the formation of tablet as a antiretroviral. RP-HPLC method give the data of the forced degradation study of Efavirenz in different conditions such as acidic, basic, neutral and oxidative stress condition and no degradation product were obtained, developed stability. From the result it is found that the both the methods are reliable and reproducible.

Conclusion: The attempt of solubility enhancement of Efavirenz by forming solid dispersion worked efficiently and permeability has also been achieved.

PMS 62

PIMENTA DIOICA LEAF AQUEOUS EXTRACT FOR THE GREEN SYNTHESIS OF SILVER NANOPARTICLES AND THEIR USE AS ANTIBACTERIAL AGENTS.

ABHISHEK PRAKASH TIWARI1* AND RAJKAMAL TIWARI2

1 Nanomaterials and Sensor Research Laboratory,
Department of Physics,
School for Physical and Decision Science,
Babasaheb Bhimrao Ambedkar University,
Lucknow 226025, U.P., India.
2Central Institute of Petrochemicals Engineering & Technology (CIPET),
Department of Chemicals and Petrochemicals,
Ministry of Chemicals & Fertilizers,
Govt. of India, LUCKNOW 226008, U.P., India.
Corresponding author Email: aptiwari@bbau.ac.in

Abstract

The majority of infectious diseases that affect people today are brought on by bacteria. Antibiotic resistance microorganisms were created as a result of overuse and require medical intervention. As a result, there is a need for a different antimicrobial agent that is both safe and more effective. Silver nitrate solution was changed into nano-silver using the Pimenta dioica. Pimenta dioica leaf extracts were used to make AgNPs through a green synthesis process. The emergence of nanoparticles in the media is confirmed by pictures obtained using scanning electron microscopy, particle size analysis, and UV-VIS spectroscopy. Protein amide (I) and (II) bands served as a capping and stabilising agent on the surface of nanoparticles, according to FTIR measurements. Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa bacteria were used to test the antibacterial properties of produced silver nanoparticles. These bacteria, both Gram positive and Gram negative, are susceptible to the AgNPs.

Keywords: Metal oxides; Nanoparticles; Antimicrobial activity

PMS 63

SYNTHESIS AND CHARACTERIZATION OF FLUOROPHOSPHATEGLASSESACTIVATED WITH ER3+IONS FOR LUMINESCENT APPLICATIONS.

K. VENKATA RAO 1* , S. VIDYA SAGAR 1 , G. PULLAIAH1

1 Dept. of Physics,
Govt. Degree College,
Porumamilla, Kadapa,
Andhra Pradesh-516193, INDIA
*Corresponding author Email:drvenkataraok@gmail.com

Abstract

In the current work using melt-Quenching, a series of fluorophosphate glasses was prepared with composition (60-x) NH4H2PO4 +10MgO+10ZnO+10BiF3+10KF+xEr2O3 where x is 0.3, 0.5, 1.0, 1.5 and 2.0 mol%. The amorphousness of prepared samples was established by XRD. Several absorption bands were recorded in prepared samples from the ground state to the excited state with corresponding transitions. From these transitions, the Judd-Ofelt (JO) intensity parameters Ωλ (λ=2, 4, 6) were calculated for each glass which follows the trend Ω2>Ω6> Ω4. The JO intensity parameters Ω2, Ω4 and Ω6 range between (0.77-1.12) ×10-20cm2, (0.008-0.24) ×10-20cm2 and (0.16-0.39) ×10-20cm2 respectively.JO intensity parameters are used to estimate the radiative parameters like transition probabilities, radiative lifetimes and branching ratios. From emission spectra, peak stimulated emission cross-section was estimated. The emission spectra show three peaks in the UV Visible region, located around 526nm, 553nm and 684nm, which correspond to transitions 2H11/2→4I15/2,4S3/2→4I15/2and4F9/2→4I15/2. The peak (4S3/2→4I15/2) about 553nm is more intense and significant than the other peaks, indicating that green light is being emitted in the UV-Visible zone. The results suggest that the studied Er3+ ion-doped fluorophosphate glasses could be promising candidates for solid-state lighting applications.

Keywords: Er3+glasses; fluorophosphate glasses; Judd-Ofelt parameters; X-ray diffraction; FTIR;SEM

PMS 64

DEVELOPMENT OF ANALYTICAL METHOD AND STUDY OF SOLUBILITY ENHANCEMENT OF DRUG AND DETERMINATION OF ITS INTESTINAL PERMEABILITY

RUCHITA KELWADKAR, NISHIKANT RAUT, MADHURI NAKHATE

Department of Pharmaceutical Sciences,
RTMNU, Nagpur-440033, India
Corresponding author: kelwadkarruchi@gmail.com
nishikantraut29@gmail.com

Abstract

Background: Molecules with poor aqueous solubility and bioavailability are the major obstacles in formulation of efficient pharmaceutical products. So, the optimum solubility of active pharmaceutical ingredients is needed to improve bioavailability. Efavirenz is antiviral drug belongs to non-nucleoside reverse transcriptase inhibitor (NNRTI) which have lower solubility. This study is performed to enhance solubility of Efavirenz by analytical method development and by determination of intestinal permeability.

Method: The solubility of Efavirenz was enhanced by using solvent evaporation method which was performed by reducing the drug particle size at molecular level using various organic solvents. The method development was carried out by UV spectroscopy and RP-HPLC chromatography. In UV spectroscopy, absorbance of drug was recorded at 247 nm and In RP-HPLC, Efavirenz was run through C-18 column to study forced degradation study. The dissolution and permeation procedures were done to enhance intestinal permeability.

Result: The mixture of pure drug and polymer was responsible for interaction between drug and polymer via hydrogen bonding which ultimately enhance the solubility of drug, it was characterized by FT-IR, PXRD and SEM. Method is validated by UV which showed that Efavirenz can be used for the formation of tablet as a antiretroviral. RP-HPLC method give the data of the forced degradation study of Efavirenz in different conditions such as acidic, basic, neutral and oxidative stress condition and no degradation product were obtained, developed stability. From the result it is found that the both the methods are reliable and reproducible.

Conclusion: The attempt of solubility enhancement of Efavirenz by forming solid dispersion worked efficiently and permeability has also been achieved.

PMS 65

PREVENT RAIL ACCDIENT VIA MONITORING TRACKS AND GATES

DINESH VASANT MAHADANE

Student of Electrical Engineering Program
Guru Gobind Singh College of Engineering & Research Centre Nashik, Maharashtra
Applied for Membership (Indian Science Congress) Keywords – MSBTE - Maharashtra State Board of Technical Education

Abstract

The increased growth in the railway sector has resulted in an increase in the train traffic density across the world. This has resulted in the increase in the number of accidents involving trains. In this paper, the proposed system includes several features which prevent train accidents. Fire detection, detaching of couch automatically when fire is detected in it, automatic railway gate control and track continuity. This system makes use of, fire sensor and other embedded systems. In this system way avoids manual errors and provide ultimate safety to road users. Gatekeeper not necessary and automatic operation of the gate through the motor. The mechanism works on a simple principle. Railway industry has a valuable role in economic development of each country. India's massive rail network is hit by an average of 300 accidents a year. Accident management in railway decision making has to consider the following two issues to avoid or mitigate the damages 1. Accident prevention and development of an alarming system to predict and alarm before the occurrence of accidents. 2. Reduction of negative effects of accidents after its occurrence through proper emergency and management services. Railway accidents are often taking place. The reasons are of different types. Improper signaling is the main reason. Very big economical losses are to be faced. So, the precautions are to be taken in order to avoid, such incidents

PMS 66

INNOVATIVE WAVE FUNCTION APPROACH TO THE STUDY OF IONIC CRYSTAL POTENTIALS.

VERSHA JOSHI1 VIMAL SAGAR AND J N THAKUR

Research scholar1 University Department of Physics
B.N.M. University,
Madhepura (Bihar)

Abstract

In this research paper we describe the wavefunctions and eigenvalues of different orbits of ion and interaction between the electrons of core orbit and conduction electrons. The only input required other than fundamental constants are wavefunction Ψnl and coreeigen value (Єnl) of different core states of Aluminum (1s,2s & 2p) respectively giving rise to the valence charge potential, core electron potential, conduction band core exchange potential, conduction electron potential, screening potential (all in negative in magnitude) and repulsive potential (positive in magnitude) using Harrison (1) and Thakur (2): The screening potentials and repulsive potentials are calculated by computing orthogonality coefficients of different core states and it is found the highest S-state contributes more followed by highest P-state. These potential are modified by recent values of electronic exchange parameter α in Xα-exchange and exchange and correlation correction functions for the Hartee dielectric function.

The material science occupies a central place in our scientific and technological development through innovation of novel materials that have relevance in various fields including communications information technology solar energy, nuclear power, space exploration bio-synthesis micro-electronics, quantum computing etc. The exciting properties of exotic materials like quasi-crystals, fullerenes, carbon-nano-tubes, hydro gas storage materials etc have comes into prominence during last decade and these are expected to have a major technological application in coming years. The innovation and application of a variety of solid materials have been an on-going process in which physicists have played on important role. The condensed matter physics has proved a fertile ground for theoretical physicist as well for innovative theories and ideas to understand the physical interactions and decide the given properties of materials.

PMS67

TRI-HYBRID ELECTRICITY GENERATION METHOD FOR EV CHARGING STATION BY USING MFC, SOLAR AND WIND ENERGY

SUNIL MAGAN MORE

Electrical Engineering Program
Sri Satya Sai University of Technology & Medical Sciences
(SSSUTMS) Sehore MP
Email- sunil.more@ggsf.edu.in
Shweta Mahendra More
Guru Gobind Singh Public School & Jr. College Nashik

Abstract

This paper reviews Microbial Fuel cell, Solar& Wind energy. First objective is to discuss microbial fuel cell. Second objective is to put forth various experiments done by me in generating electricity through microbial fuel cell. Till now majority of Microbial Fuel cell are using graphite as anode and cathode separated by Proton exchange membrane. I have used Graphite and Magnesium as electrodes for generating electricity in single chamber without any membrane. This MFC can be used for various applications. Also a new concept of generating electricity with solar panels and using the area beneath it for generating energy with MFCs, while at the same time a small wind turbine while be used as a third hybrid electricity generating partner. This technology can revolutionize the current energy production method. Also the reason behind bringing this technology into light is to show that it is green, free, hazard free, flexible, compact and unending availability. One can generate electricity at home for own consumption. This generated energy is going to be utilize for charging of Electrical vehicles at different places.

Microbial cell is a very easy and simple method to get energy from soil. This battery generates voltage of 1.5 to 1.8 volts. It is totally green and renewable. This energy can be used to turn on led lights, buzzers, calculators, digital watches etc. Tomorrow we may see this energy being used in many Gadgets (as energy requirement for electronics devices getting reduced day by day).

This paper is a result of 7 years of research and development, trial and error and infinite ideas.

Keywords: Microbial fuel cell, Renewable energy, Free energy, perpetual energy, non-conventional energy, EVCS Electrical Vehicle Charging Station

PMS-68

CHANGE OF ELECTRONIC PROPERTIES OF SINGLE-WALLED CARBON NANOTUBES WITH STONE-WALES DEFECTS: A DENSITY FUNCTIONAL APPROACH

KEKA TALUKDAR

Nadiha High School,
Durgapur-713211, West Bengal, India
**Email:keka.talukdar@yahoo.co.in*

Abstract

Tuning the electronic properties of the carbon nanotubes (CNTs) like band gap is a very promising research in engineering to prepare the next-generation of electronic devices. But to achieve the maximum benefit out of the device, the factors influencing their electronic properties need to be investigated thoroughly. In this work, the alteration of the electronic behavior of a chiral, an armchair, and a zigzag single-walled CNT(SWCNT) of nearly equal diameters is investigated by density functional theory adopting tight-binding approximation. Moreover, hamiltonian matrix elements are calculated in this method by self-consistent charge distribution. The CNTs are simulated in defect-free conditions and also with an increasing number of Stone-Wales defects. In this study, modification of band gap is reported with the introduction of defects. The density of states is also modified considerably when a certain number of defects are introduced into the SWCNTs.

Keywords: Single-walled carbon nanotubes, Stone-Wales defects, Density functional theory, Density of states, Band structure

PMS69

EFFECT OF CALCIUM AND MAGNESIUM COATING ON DEFLUORIDATION CAPACITY OF ACTIVATED ALUMINA GRANULES

[1]R. M. BELEKAR, [2]S. A. ATHWALE, [3]A. S. KAKDE, [4]R. K. MAHADULE, [5]G. C. WAKDE, [6]B. A. SHINGADE

[1]Department of Physics,
Government Institute of Science,
Nagpur, Maharashtra,440 001, India
[2]Department of Physics,
Government Vidarbha Institute of Science and Humanities,
Amravati, Maharashtra, 444 604, India
[3]Department of Physics,
Amolakchand Mahavidyalaya,
Yavatmal-445001, India.
[4]Department of Physics,
S.Chandra Mahila Mahavidyalaya,
Sadak Arjuni, Dist. – Gondia, 441 807, India
[5]Department of Physics,
N.K.S Model College,
Karanja-442 203, India.
[6]Department of Physics,
Bhawabhuti Mahavidyalaya,
Amgaon, Distt. Gondia-441902, India
Corresponding author email: rajubelekar@gmail.com

Abstract

The contamination of fluoride in ground water has become global issue which has developed major threat to human health worldwide. Adsorption technique for water defluoridation is widely used method due to its greater accessibility and lower cost. Activated alumina is excellent adsorbent for fluoride removal however it has certain disadvantages like narrow operating pH range, formation of toxic fluoride complexes and metal leaching. To overcome these issues we have prepared calcium and magnesium coated activated alumina granules of size nearly 3 mm by hydrolysis of aluminum sulphate which is simple, cheap and economic method. The prepared granules were characterized and identified by XRD, FT-IR and SEM technique. The XRD, FT-IR and SEM micrographs confirms the formation of homogeneous and porous γ alumina phase with average particle size of around 45 nm. The fluoride removal capacity

of the granules was investigated by column studies using freshly prepared fluoride stock solution. The calcium magnesium coated alumina granules shows decreased removal capacity than pure alumina granules however no formation of toxic aluminium complexes in the treated water were observed.

Keywords: Calcium magnesium coating, defluoridation, activated alumina, hydrolysis method.

PMS70

EFFECT OF ZINC OXIDE NANO FILLERS ON DC ELECTRICAL CONDUCTIVITY OF POLYSTYRENE AND LOW DENSITY POLYETHYLENE

MANISHA C. GOLCHHA*

*Department of Physics,
Brijlal Biyani Science College,
Amravati (MS), India.

Abstract

Polymer inorganic nanocomposites (PINCs) thin films were prepared by solution cast technique using two polymers, Polystyrene (PS) and Low Density Polyethylene (LDPE) with Zinc Oxide Nanoparticles (ZnO NPs) as filler in different wt.% (0, 0.5, 1, 3, 5). To confirm the presence of ZnO NPs, the samples were characterized with XRD. The dc electrical conductivity of ZnO/PS and ZnO/LDPE was examined as function of filler concentration. In both PINCs samples, the conductivity wasfound to be increased with increase in filler concentration. The ZnO NPs seemed to be more active in improving conductivity of PS as compared to LDPE samples.

Keywords: ZnO NPs, PS, LDPE, PINCs, DC Electrical Conductivity.

PMS71

ACTIVATION ENERGY IN POLYANILINE DOPED PVC-PS BLEND

LAXMI AKHILESH SHARMA

Brijlal Biyani Science College,
Amravati

Abstract

The Polyblend of Polyvinyl Chloride (PVC) and Polystyrene (PS) in the weight ratio 5:1 were prepared by using 1.25 gm of PVC and 0.25 gm of PS. Polyaniline (PANI) has been used as dopant . AC Activation energy for sample at different frequency range 0.5 KHz – 200 KHz have been investigated. AC Conductivity of thin film of Polyaniline doped PVC-PS polymer blend have been studied.

Keywords- Polyaniline, PVC, PS, Activation Energy

PMS72

SYNTHESIS AND CHARACTERIZATION OF NATURALLY DERIVED SiO_2 AND CaO FOR 45S5-BIOACTIVE GLASS AND CELLULOSE COMPOSITE FOR WOUND HEALING APPLICATIONS

SAMADHAN B. GAIKWAD[1], ANIL V. GHULE[1]

Department of Chemistry,
Shivaji University, Kolhapur,
Maharashtra, 416004 India.

Abstract

The management of skin damage is assumed an unmet clinical need, and no entirely satisfactory solution to this problem exists to date. This study synthesized ordinary bioactive glass (BG) 45S5 powder with a quaternary composition via a sol-gel route. Using the sol-gel method, we prepare copper (Cu) doped 45S5 BG and Cellulose composite from naturally derived biomaterials. Crystal structure, particle morphology, and the presence of chemical functional groups in the synthesized materials were determined using XRD, FE-SEM, FTIR, BET, and Raman spectroscopy. The prepared composite material was studied by In-vitro and ex-ovo from that, bioactive glass and cellulose composite derived from natural sources could improve biological properties in wound healing applications.

Keyword: Biomaterials, Tissue engineering, Bioactive glass, Wound healing.

PMS73

SMART TEXTILES FOR HEALTH CARE

RESMI G[1] AND MUKTHY SUMANGALA[2]

[1]Assistant Professor - Senior Scale,
Department of Design,
Manipal School of Architecture and Planning,
Manipal Academy of Higher Education,
Manipal, Udupi, Karnataka.
resmi.g@manipal.edu

[2] Assistant Professor,
Department of Fashion Management Studies,
National Institute of Fashion Technology (NIFT),
Kerala.
mukthy.s@nift.ac.in

Abstract

Smart textile is one of the growing sectors with the potential to monitor health remotely and save life. It is the combination of textiles with sensors, processors, actuators, fabric conductors, semiconductors, and insulators to incorporate electronic functions in hand with comfortability. Characterization of smart textiles is one of the important factors to ensure the safety of technology, and the quality of the product, which signifies the need to develop required standard testing methods. There is great potential for smart textiles in the area of health care and more research and product development need to be initiated to elevate it from research to commercial product.

Keywords: Smart Textiles, Healthcare textiles, Sensors, E-textiles, Intelligent textiles

PMS74

FORMULATION AND CHARACTERIZATION OF SOLID DISPERSION BASED ORODISPERSIBLE TABLET

[1]PRANALI M.PALANDURKAR,[2]YOGITA R.MOHINKAR*, [3]PRASHANT K.PURANIK

[1] , [2] ,[3]Department of Pharmaceutical Sciences,
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur, 440033 Maharashtra, India.
Corresponding Author : pkpuranik@yahoo.com
Presenting author email : yogitamohinkar@gmail.com

Abstract

Aim: Formulation and characterization of solid dispersion based Orodispersible tablet.

Objective : a)To increase the solubility of BCS Class ll drug Lacidipine using solid dispersion technique b) Formulation of orodispersible tablet by using Design expert and its evaluation.

Methodology : Solid dispersions of Lacidipine were prepared and optimized by solvent evaporation method using full factorial design. Prepared solid dispersion were characterized by using different techniques such as FTIR, DSC, XRD etc. Phase solubility study and saturated solubility/ drug content of solid dispersion containing drug and polymer (Soloplus®) was determined. The Partition coefficient (log p) of solid dispersion was also determined. The prepared solid dispersion was formulated and optimized in Orodispersible tablet (LCD SD) by 3^2 full factorial design. The independent variable in optimization were concentration of MCC101 as a binder, concentration of cross povidone (superdisintegrant) and % of cumulative drug release, dispersion time were dependent variable. The prepared tablets were evaluated for different parameters and optimised tablets were further evaluated for different parameters.

Result : It was observed that solid dispersion of Lacidipine showed increased in solubilty (0.0865 mg/ml) as compared to plain drug (0.00476 mg/ml) i.e (18 times).It was confirmed with improved partition coefficient (3.95±0.21) . The drug content observed in optimised solid dispersion was found to be 95.29±0.42%.All the components solid dispersion of drug and excipients were found compatible with each other

. The orodispersible tablet containing LCD SD were formulated and evaluated with orodispersible tablet containing plane drug. It was found that % cumulative drug release of Optimised SD ODT was found to be 93.72% as compared to ODT containing plane drug (44.36%). The optimum dispersion time of SD ODT was 27 sec. The stability study shows stable SD at 25 ±2 ºC and over a period of 1 month.

Conclusion : Thus solid dispersion technique increases the aq. solubility (18 times) and dissolution of LCD (2.11 times) and hence it may bring to improvement in bioavailability. Also orodispersible tablet can be a better formulation for patient as it has high patient compliance, fastest on set of action and may increase the bioavailability of drug.

Keywords: Solid dispersion, Lacidipine, Orodispersible tablet, Soloplus®

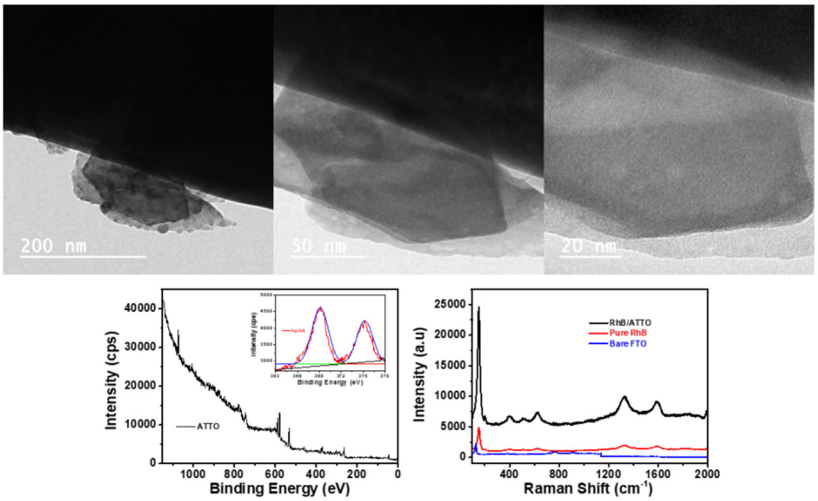
PMS75

SURFACE-ENHANCED RAMAN SCATTERING ACTIVE FTO SUBSTRATE FROM PYROCHLORE FOR DETECTION OF RHODAMINE B DYE

MOHAN E. AND SOMESHWAR POLA*

Abstract

Silver metal ions have been ultrasonicated-exchanged onto layer type Na_2TiTeO_6 (NTTO) pyrochlore on FTO substrate through blade coating process to get Ag_2TiTeO_6 (ATTO). Here, ATTO with mean pore size of ~10 nm was used as both a ultrasonication process. ATTO mesoporous mixture assemblies display an extremely penetrating and consistent surface enhanced Raman scattering (SERS) retaliation. A measurable concentration as low as 10 ppm of rhodamine B has been accomplished with an enhancement factor (EF) of 4.8×10^5. No fading was detected for the existing substrata after storage in air for one month. The higher EF is fundamentally ascribed to a amalgamation of electromagnetic improvement and charge transference mechanism.



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PMS76

FUNCTIONALIZED NANOGRAPHENE OXIDE AS A BIOMEDICAL AGENT FOR ANTI-CANCEROUS THERAPY

VIJAY PRAKASH JAIN[A] AND GAUTAM JAISWAR[A*]

[a]Department of Chemistry,
Dr. Bhimrao Ambedkar University,
Agra 282002, U.P., India
*Corresponding author.
E-mail address: gjaiswar@gmail.com (G. Jaiswar).

Abstract

The field of nanoscience has blossomed over the last two decades and the importance of nanotechnology has increased in areas such as computing, sensors, biomedicine, and many other applications. The chemical versatility of nano-GO arises from the oxygen functional groups on the carbon structure that make possible its relatively easy functionalization, under mild conditions, with organic molecules or biological structures in covalent or non-covalent linkage. However, the direct application of nano GO in cancer therapy is severely hindered by their poor colloidal stability, sub-optimal safety, inefficient tumour uptake and non-selectivity towards cancer cells. To overcome these limitations, nano GO have been functionalized with different types of materials. Its intrinsic optical, mechanical and electronic properties, allow the development of new multifunctional hybrid materials with a high potential in multimodal cancer therapy. GO-based combination therapy of chemotherapy also implies good potential for metastatic cancer.

PMS77

A STUDY OF SIGMA-DELTA MODULATOR PERFORMANCE FOR AUDIO APPLICATION

*** JYOTINDRA KUMAR , ** ASHUTOSH KUMAR, ***AKRITI MADHU,**

*Assistant Professor
K.V. Science College Uchchaith,
LNMU, Darbhanga
**Assistant Professor, B.R.B. College,
Samastipur
***Research Scholar
Department of Physics,
LNMU, Darbhanga

Abstract

Analog to Digital converters fined different usage in various receiver design architectures. Analog modules appear to be precise and quite resistant to a variety of sources of noise and interference. Most of the highly precise A/D converters involve the use of sigma-delta modulation which is associated with over sampling and noise shaping. These converters use the least parasitic capacitances and small feature sizes characteristic of scaled VLSI technology by trading speed for resolution.

Keywords– Analog-to-digital converter, Sigma Delta modulation, over sampling

PMS78

FABRICATION OF POLYANILINE/GRAPHENE OXIDE COMPOSITES FOR HUMIDITY SENSING ANALYSIS

DIVYANSHI SRIVASTAVA[1,2], RAJESH KUMAR SHUKLA[1] AND SHEO KUMAR MISHRA*

[1] Condensed matter & material Research lab, Department of Physics, University of Lucknow, Lucknow, 226007, U.P, India
[2] Shri Ramswaroop Memorial University, Deva road Barabanki, 225003, U.P., India

Abstract

This work reports the measurement of impedance variations under various humidity conditions at frequency ranges between 100 Hz to 5 MHz. The electrochemical polymerization process has been used to synthesize by varying the mass ratios of graphene oxide (GO) in Polyaniline (PAni). The electrochemical deposition method has been used to make samples film on an ITO glass slide. The percentage relative humidity of the samples was estimated to be 20 to 90 %. It has been found that impedance and humidity show an inverse relation, i.e., the impedance value decreases with an increase in humidity. In contrast with platitudinous capacitive humidity sensors (PC-HS), the GO-based humidity sensor has a sensitivity of approximately ten times more elevated than traditional sensors. Moreover, it has been demonstrated that the humidity sensor shows a fast response and recovery time. Therefore, GO appears to be a consummate material for building a humidity sensor with high sensing for a comprehensive approach.

Keywords: Electrodeposition; Humidity Sensing; Chronoamperometry; Cyclic-voltammetry; Photoluminescence

PMS79

ANALYSIS OF THE MAGNETIC AND MICROWAVE ABSORPTION OF BI-SUPPLEMENTED LEAD HEXAFERRITE

Y.D. CHOUDHARI*, P. J. CHAWARE, K.G. REWATKAR, N. M. GAHANE

Department of Physics,
Dr. Ambedkar college, DeekshaBhoomi, Nagpur-10, India.
Vidya Vikas Art, Commerce and Science College, Samudrapur, India
Email: yograjchoudhari476@gmail.com, pritichaware@gmail.com, kgrewatkar@gmail.com,

Abstract

In this study, the effect of bismuth ion doping on the magnetic and microwave absorption properties of lead hexaferrite nanoparticles ($PbFe_{12-y}BiyO_{19}$, y=0.2 to 0.8) synthesized by the microwave-induced sol-gel auto-combustion method was examined. The materials are single-phase hexagonal ferrite with an average crystalline size between 43 and 58 nm and a space group of P63/mmc, according to an examination of the crystalline phase of the synthesized materials using XRD data plots up to x=0.8. Calcium hexaferrite's coercive force is increased by adding Bi^{3+} ions from 2756 to 4386 Oe; however, the saturation magnetization increases from 38.003 to 49.016 emu/g with increasing Bi^{3+} concentration. The squareness ratios of every specimen were found to be less than the ideal value of 0.5, demonstrating that the synthetic Bi-substituted Pb hexaferrite is made up of nanoparticles with only one magnetic domain. The X-band microwave absorption parameters were captured using a vector network analyzer. For a specific thickness of 2 mm and a frequency range of 8–12 GHz, reflection loss values were calculated using transmission line theory. Lead hexaferrite with a bismuth substitution has physical properties that make it possible to predict the layer's size and frequency, which lowers reflection loss. The loss is the greatest at -15.19 dB (78 percent at 10.10 GHz when x=0.8). It demonstrates that it has a number of uses, including a magnetic recording medium and permanent magnets

Keyword: Conductivity, sol-gel method, loss tangent, VSM, XRD etc.

PMS80

ELECTRICAL AND MAGNETIC CHARACTERIZATION OF NANOSTRUCTURED $Ni(CoZr)_xFe_{2-2x}O_4$ SPINEL FERRITE SYNTHESIZED BY SOL GEL AUTO COMBUSTION METHOD

N. S. MESHRAM* M. A. BORIKAR D. M. BORIKAR# K. G. REWATKAR***

*Department of Physics,
Dr. Ambedkar College,
Deekshabhoomi, Nagpur
**Department of Chemistry,
St. Vincent Pallotti Engineering College, Nagpur
#Department of Chemistry,
Dr. Ambedkar College,
Deekshabhoomi, Nagpur
Corresponding Author :- nandun16@gmail.com

Abstract

The synthesis of $(CoZr)^{6+}$ substituted Nickel ferrite with composition $Ni(CoZr)_xFe_{2-2x}O_4$ was carried out by sol gel auto combustion route. Structural and Morphological study of the synthesized material was done by X-ray diffraction spectroscopy (XRD) and Transmission electron microscopy (TEM) respectively. The analysis of X-ray diffraction pattern at room temperature showed the formation of a single phase cubic spinel ferrite. So also, the values of lattice parameters (a) confirmed the same. TEM analysis suggested the formation of nano size particles whereas the Energy Dispersive X-ray analysis (EDAX) confirmed the presence of constituent elements in stoichiometric ratio. Electrical properties were studied to determine the ferri to para transition temperature. Vibrating Sample Magnetometer (VSM) was used to study the magnetic properties of the samples. The magnetic properties of synthesized nano material showed low values of saturation magnetization (Ms), Remenance (Mr) and Coercivity (Hc) thereby confirming the more suitability of such samples to be used as permanent magnet, communication device, microwave device materials and magnetic storage recording media.

Keywords: Sol gel auto combustion route, cubic spinel ferrite, electrical properties, XRD, TEM, VSM, magnetic property etc.

PMS81

STRUCTURAL AND MAGNETIC PROPERTIES OF Ti-Zn SUBSTITUTED Ni-FERRITE

R. T. UBALE[1], M. K. BABREKAR[3], Y. R. LINGAYAT[2], C. M. KALE[3]*, S. J. SHUKLA[2]

[1]Department of Physics,
Siddharth Arts Commerce and Science College, Jafrabad-431206
[2]Research Center, Deogiri College,
Aurangabad, (M.S.) India
[3]Department of Physics, Indraraj Arts,
Commerce and Science College,
Sillod- 431112, (M.S.) India.

***Corresponding author:** cmkale1973@gmail.com

Abstract

In this investigation, the chemical composition $NiFe_{2-2x}Ti_xZn_xO_4$ (x = 0.00, 0.05, 0.10, 0.15, and 0.20) were prepared by sol-gel auto combustion synthesis to understand the influence of Ti-Zn doping on the structural as well as magnetic properties. The X-ray diffraction (XRD) technique was used to investigate the structural parameters. The crystallite size estimated from the Debye Scherrer formula was found to be 19-22 nm. The magnetic properties were studied by using the M-H hysteresis loops tracer technique at room temperature using a VSM. Observed that, an increase in Ti content x, the saturation magnetization measured from the M-H hysteresis plot showed a decreasing trend.

PMS82

Sm^{3+}- IOND OPED ZINC PHOSPHATE GLASSES FOR PHOTONIC APPLICATIONS: FABRICATION AND OPTICAL CHARACTERIZATION

S. VIDYA SAGAR[1], S. BABU[2], K. VENKATA RAO [1*], N.V. SRIHARI [3]

[1] Dept. of Physics, Govt. Degree College, Porumamilla, Kadapa, Andhra Pradesh-516193, India.
[2] Dept. of Physics, Rajeev Gandhi Memorial College of Engineering & Technology, Nandyal, A.P-518501, India
[3] Dept. of Physics, Govt. Degree College, Kandukuru, Prakasam, Andhra Pradesh-523105, India.
victor.sagar07@gmail.com

Abstract

Using melt quenching, zinc phosphate glasses were synthesized in the composition (60-x)P_2O_5-20ZnO-10LiF-10SrO-xSm_2O_3: xSmSrLiZnP where x is 0.1, 0.5, 1.0, 1.5 and 2.0 mol respectively. From the optical absorption spectra of ZnP glasses, oscillator strengths andJudd-Ofelt(J-O) intensity parameters $\Omega_\lambda(\lambda = 2,4,6)$ were calculated and they were in trend $\Omega_4 > \Omega_6 > \Omega_2$. The emission spectra of synthesized ZnP glasses excited at 403nm show four emission peaks around 565nm ($^4G_{5/2} \rightarrow {}^6H_{5/2}$), 602 nm($^4G_{5/2} \rightarrow {}^6H_{7/2}$), 648nm($^4G_{5/2} \rightarrow {}^6H_{9/2}$), and 710 nm($^4G_{5/2} \rightarrow {}^6H_{11/2}$). The high intensity peak $^4G_{5/2} \rightarrow {}^6H_{7/2}$ corresponds to a reddish-orange color. These glasses generate a strong reddish orange luminescence. In conclusion, the Sm^{3+}ion doped zinc phosphate glasses offer potential as reddish-orange lighting components.

Keywords: Sm^{3+} glasses; Zinc Phosphate glasses; Judd-Ofelt analysis; Luminescence properties.

PMS83

ELECTRONIC- TRANSPORT PROPERTIES OF SOLID LIQID METALS BY MODIFIED PSEUDO POTENTIAL THEORY

VERSHA JOSHI[1] VIMAL SAGAR AND J N THAKUR

1) Research Scholar, University Department of Physics, B.N.M.U. Madhepura (Bihar)
versha.joshi19@gmail.com

Abstract

Our understanding of metals began in 1900, when Drude suggested that the electrons were free to run through the entire metal rather than simply associated with individual atoms. Sommer field applied quantum statistic to electrons.

Theoretical understanding of a wide variety of properties developed rapidly using the nearly free electrons approximation Ziman and Brodley have given expressions for the computation of electrical resistivity, conductivity Thermoelectric power etc of solid and liquid metals by using modified pseudo potential theory. At the same time known, Fermi, Surface could rule out many models which has been proposed to study some property of particular metal. Out of this work come one fact which is fundamental of the “pseudo potential theory”. It is interesting to note that the nuclear and solid state physicists has been concurrently using analogous method. In view of this we look for a method which starts from the atomic structure and provides a method to constant the different types of crystal potentials. In this approach the input required other than fundamental constants are the core cigen values, core wave function and Lattice constants. This Pseudo potential method is based on three fundamental assumpitions for the calculations of physical/chemical properties of metals. Viz, (i) The self consistent field approximation (ii) The small core appsoximation and (iii) The perturbation theory. The base ionic potentials calculated from the core eigenunctions and core eigen values include within itself the following components for the study of electronic transport properties of metals and alloys : (a) Valence charge potential (b) Core potential (c) Conduction Band core exchange potential. (d) conduction electron potential (e) screening potential and (f) Repulsive potential. The screening potential and repulsive potential are computed by using the orthogonality coefficient which depends on the wave function of 1s, 2s & 2p core states in case of sodium. It is found that 2s-State Contributes predominantly in comparison to core states is and 2p

the 2p state contributes very little at lower k/kf (k= Electron wave vector; kf = Fermi wave vector). 1s core state got relatively small effect is comparison to other states. The contributions of 1s and 2s. States are practically constant within the range k/kf =0 to 1.0. The contribution due to 2p state increased rapidly and reaches maximum at k/kf =1.0. The only positive component of the ionoc potential of sodium is repulsive potential where as the valence charge potential core potential, conduction band core exchange potential, conduction electron potential and screening potential are negative in magnitude. The resultant potential is called pseudo potential and this potential weak in magnitude. The pseudo potential form factors are calculatedby using the Hartee dielectric functions and pseudo potential. The form factors are used to calculate different physical and chemical properties using the structure factors of metals and alloys. The Calculated results are found in excellent atreatment with experimental values of cusak

Keywords : Crystal Potential, conduction Band core exchange potential, Screening Potential repulsive potential, pseudo potential form factor.

PMS 84

DISCOTIC LIQUID CRYSTALS TAILORED BY PLASMONIC NANOPARTICLES FOR PHOTOVOLTAIC APPLICATIONS

MUKESH MISHRA[A*], SANDEEP KUMAR[B], AND RAVINDRA DHAR[A]

[a]Center of Material Sciences, University of Allahabad,
Allahabad, India -211002.
[a]Shri Ramswaroop memorial University, Lucknow Deva Road-255003
[b]Raman Research Institute, C.V.Raman Avenue, Sadashivanagar,
Bangalore, India-560080.
E-mail-mukeshphysics927@gmail.com, mukesh.phy@srmu.ac.in

Abstract

Experimental characterization of the composites of colloidal Gold Nano Particles (GNPs) size 5 nm in the columnar discotic liquid crystal namely 2,3,6,7,10,11- hexabutyloxytryphenylene (HAT4) possessing plastic columnar phase (Col_{hp}) phase has been carried out. Thermophysical properties have been investigated by differential scanning calorimetry (DSC), UV- Vis spectroscopy, polarizing optical microscopy (POM) and dielectric spectroscopy. GNPs have been dispersed in the concentrations of 3.0 wt% in pure HAT4. Phase sequences as obtained from DSC and POM for pure HAT4 and its composite with GNPs are as follows:

Pure HAT4: Cr-(87.2 °C)-Col_{hp}-(145.3 °C)-Iso

HAT4+ 3 wt% GNPs: Cr-(86.2 °C)-Col_{hp}-(134.1°C)-I

where, Cr, Col_{hp} and I represent crystal, columnar plastic and isotropic liquid phase respectively. The above phase sequence suggests that the Col_{hp}-I transition temperature is depressed; however, melting temperature remains almost same. In the columnar mesophase DLCs behave like one-dimensional conductor. Our studies show that the GNPs increase the dc conductivity of HAT4 by about two orders of magnitude in columnar phase. At 90 ºC the ionic conductivity of pure HAT4 is 7.8×10^{-10} $Sm^{-1}$and that of composite sample is $1.3\times10^{-7}S\text{-}m^{-1}$. At 135 °C the ionic conductivity of pure HAT4is 3.7×10^{-9} $S\text{-}m^{-1}$and the composite $1.3\times10^{-6}S\text{-}m^{-1}$. These results suggest that GNPs improved stacking of the disc-like molecules within the columns and possessing high charge mobility. Dielectric permittivity measured parallel to the column axis in the homeotropic aligned sample is increased. In case of pure and dispersed sample permittivity increases from 3.0 to 3.3 at a temperature 90 ºC and frequency 100 kHz. Band gap has decreased due to dispersion

of GNPs in discotic liquid crystalline materials. Increase of conductivity may be exploited to enhance efficiency of photovoltaic cells[1-2].

Keywords– Discotic liquid crystals - nanocomposites, dielectric properties (permittivity, ionic conductivity), homeotropic alignment.

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V

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B.S. Murty	2012
Shanker Ram	2013
L.M. Manocha	2014

Arvind Kumar Saxena	2015
Arvind Kumar Dixit	2016
Durgesh Nath Tripathi	2017
Dinesh Kumar	2018
K.Byrappa	2019
S. Srikantaswamy	2020