Sonopant Dandekar Shikshan Mandali's

Sonopant Dandekar Arts, V.S. Apte Commerce and M.H. Mehta Science College, Palghar

&

Department of Physics University of Mumbai

Jointly Organizes

"International Conference on Advanced Nanomaterials and Nanotechnology (I CAN$_N$-2019)"

November 26th- 28th, 2019

CONFERENCE VENUE

Kharekuran Road, Palghar (W),
Tal & Dist. Palghar, Maharashtra-401404
Ph.No. 02525-252163/252317
College Website : www.sdsmcollege.com

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ABOUT US

Sonopant Dandekar Shiksan Mandali's, Sonopant Dandekar Arts, V. S. Apte Commerce and M. H. Mehta Science College was established in 1970 to cater the need of Higher education in Palghar District and in vicinity with the goal **"Higher Education to all ".** Today it has become the premier institution in the University of Mumbai as well as in newly formed Palghar District. In the last few years, the institute has started various career oriented courses for undergraduate to Doctorate degrees by considering the demand of the situation and career opportunities available around the globe. In the last few years, College has achieved excellence in education and crossed many milestones. In the academic year 2017-18 the college received the Best **College Award from the University of Mumbai.**

ABOUT THE CONFERENCE

The **"International Conference on Advanced Nanomaterials and Nanotechnology (I CAN$_N$-2019)"** is being organized by Department of Physics, Sonopant Dandekar Shikshan Mandali, Palghar (Maharashtra), India on 26, 27 and 29, November 2019. **I CAN$_N$-2019** will bring pioneering researchers around the globe in the field of Advanced nanomaterials & Nanotechnology. It will provide

opportunities to young researchers to showcase their research. Accepted papers will be presented as posters and a few will be selected for oral presentations. The full length paper approved by technical committee will be published in UGC listed peer reviewed journal '

Arts, Commerce and Science Faculty of the college ranked amongst first **100** institutions of India in the nationwide survey conducted by **"India Today Group"**.

THEME OF THE CONFERENCE

"Advanced Nanomaterial and Nanotechnology"

SUB-THEMES

- **Nanomaterials and Nanotechnology**
- **Nanocomposites and Polymers**
- **Thin Film Technology**
- **Smart Nanomaterials**
- **Functional Conductive Polymeric Nanomaterials**
- **Nanomaterials for Semiconducting Devices**
- **Synthesis and Characterization of Nanomaterials**
- **Nanomaterials for Environmental Applications**
- **Nanomaterials for Renewable energy**
- **Nanomaterials for Space Application**
- **Nanotechnology in Electronics devices**

- **Nanoporous Materials**

Any other topic related to the theme.

RESOURCE PERSONS

PROF. KIM JONG KIL : Research Professor, Institute of Engineering and Technology, Hanyang University, South Korea
PROF. YUAN-RON MA : Deen, Office of International Affairs, Professor, Department of Physics, National Dong Hwa University, Taiwan
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DR. RUPESH DEVAN : Associate Professor, Discipline of MEMS, IIT, Indore, India.
DR. PRAVIN WALKE : Assistant Professor, NCNN, University of Mumbai, Mumbai, India.

PROF. KIM JONG-KIL

Manufacturing and Application Technology of Nano materials

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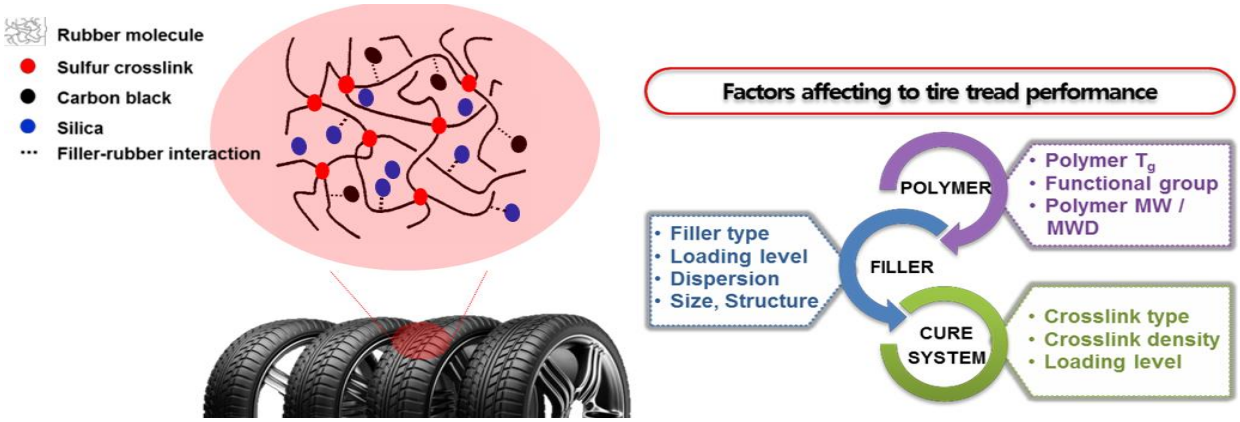
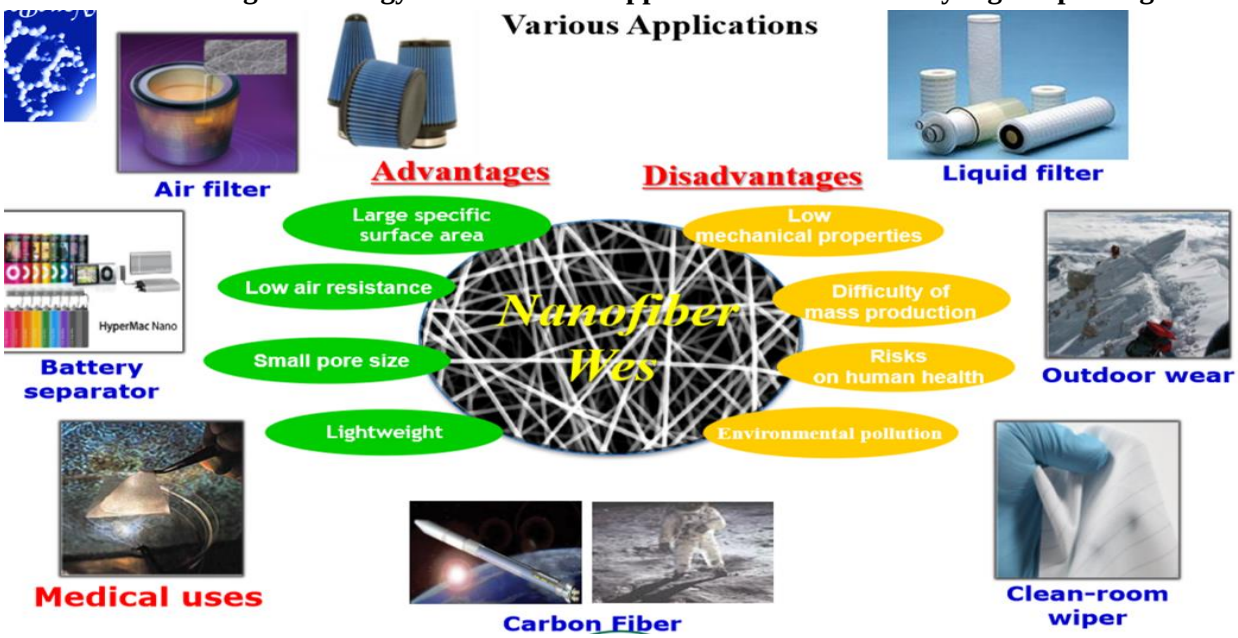
The competitiveness of universities may be how many papers they write in the past, but it is now a more important era for how many experts of Univ are involved in the development of high-tech indusry needed for

corporate sites. In this respect, I would like to introduce nano material manufacturing technology, which has recently been commercialized in Korea and Vietnam, and to introduce industrial applications.

1. **Manufacturing of NanPorousSilica-Natural Rubber Composite Materials Using Vietnamese Natural Resources and Application for Eco-Tire Industry**



2. **Manufacturing Technology and Industrial Application of Nanofiber by SigmaSpinning Process**



PROF. YUAN-RON MA

Recent work: Field-effect-transistor performance and magnetic properties of two-dimensional ferromagnetic layered CrI_3

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Chromium tri-iodide (CrI_3) is a two-dimensional layered van der Waals ferromagnetic material possessing unique semiconducting and magnetic properties. Many candidate materials can be used as channel materials for next-generation field-effect transistors (FETs). CrI_3 is one of the potential candidates for application in FET, spintronics and valleytronics, because it is a 2D ferromagnet and has giant tunneling magnetoresistance.

Recent work: Metal-semiconductor-heterojunction-assisted photoluminescence

Ranjit A. Patil, Yuan-Ron Ma *Department of Physics, National Dong Hwa University, Hualien 974, Taiwan* E-mail: ronma@mail.ndhu.edu.tw Among the metal oxides, zinc oxides (ZnO) are most likely to be the most functional materials finding many applications. We recently found that metallic Zn nanoplates also possess unique PL characteristics [1], but obviously, the PL emission mechanism is different from that of semiconducting ZnO nanostructures. Here, we demonstrate the varying PL emission mechanisms for semiconducting hollow ZnO nanoballoons, metallic solid Zn nanospheres, and metal-semiconductor concentric solid Zn/ZnO nanospheres. The PL emissions of the semiconducting hollow ZnO nanoballoons are attributed to the near band edge (NBE) and deep level electron transitions, while those of the metallic solid Zn nanospheres are mainly dependent on the electron transitions between the Fermi level (E_F) and the 3*d* band. The PL emissions of the metal-semiconductor concentric solid Zn/ZnO nanospheres are ascribed to the electron transitions across the metal-semiconductor junction, from the interface states to the valence band, and from the E_F to the valence and 3*d* bands [2]. The three nanostructures have effective visible-light emissions at room temperature, so they are good candidates for use in laser diodes (LDs) and light-emitting diodes (LEDs).

Figure 1. Room-temperature PL emission mechanism for the concentric solid Zn/ZnO nanospheres [2]. We also discuss the metal-semiconductor-heterojunction-assisted photoluminescence (PL) emission mechanism for the Bi/Bi_2O_3 heterojunction nanoparticles. [3] The Bi/Bi_2O_3 heterojunction nanoparticles comprise metallic Bi nanoparticles with Bi_2O_3 surface layers. The PL emissions that come from the Bi_2O_3 surface layers can be attributed to electron transitions from the conduction band, Fermi level (EF), and donor state (ED), respectively, to the valence bands in the Bi_2O_3 surface layers. These metallic Bi nanoparticles are helpful in the formation of PL emissions, because they provide plenty of free Fermi-level electrons to the Bi_2O_3 layers across the heterojunction. It is known that Bi is a semimetal, with its own unique Fermi surface. As the incident laser supplies thermal energy to the free electrons of the metallic Bi nanoparticles, they easily overcome the Ohmic barrier and move to the Bi_2O_3 layers. This is because the assynthesized Bi_2O_3 layers are n-type semiconductors, so that Ohmic contacts, which are one of the metalsemiconductor heterojunctions, are formed at the interfaces between the Bi nanoparticles and Bi_2O_3 layers. The metallic Bi nanoparticles can provide the majority free electrons for the electron-hole recombination that gives rise to strong PL emissions. These Bi/Bi_2O_3 heterojunction nanoparticles are potential candidates for use in optoelectronic nanodevices.

PROF. ZHIPING LAI

High flux carbon membranes for water desalination

Zhiping Lai

King Abdullah University of Science and Technology

Polymer membranes have reached their limit in water flux in water desalination. Carbon nanotubes and aquaporin are the only known novel materials that hold great potentials to overcome this limit, but require innovative ideas to fabricate them in membranes. We developed a nanoporous carbon composite membranes, comprising a layer of porous carbon fiber structures grown on a porous ceramic substrate, that exhibited 100% salt rejection with 3 to 20 times higher freshwater flux in three membrane-based desalination processes compared to existing polymeric membranes. Thermal accounting experiments found the carbon composite membrane to save over 80% of latent heat consumption. Theoretical calculations combined with molecular dynamics simulations revealed the unique microscopic process in the membrane. When the salt solution is stopped at the openings to the nanoscale porous channels and forms a meniscus, the vapor can fast transport across the narrow gap to condense on the permeate side, driven by the chemical potential gradient and aided by the unique smoothness of the carbon surface. The high thermal conductivity of the carbon composite membrane insures that most of the latent heat is recovered.

PROF. UDO SCHWINGENSCHLOGL

Valleytronics: A materials perspective

Silicene and germanene are key materials for the field of valleytronics. However, interaction with the substrate, which is necessary to support the electronically active medium, becomes a major obstacle. We show that magnetically doped WS_2 can be used as substrate that avoids detrimental effects and at the same time induces valley polarization. Broken inversion symmetry due to the presence of WS_2 opens a substantial band gap in silicene and germanene, and the induced spin polarization in conjunction with proximity-enhanced spin-orbit coupling creates sizable valley polarization. We also discuss the possibility to generate valley polarization in 2D MoS_2 by substitutional magnetic doping. An unprecedented physical-chemical mechanism, based on delicate interplay between defect state and extended moment formation, is identified as source of the valley polarization.

PROF. VIVEK POLSHETTIWAR

Plasmonic Colloidosomes of Black Gold as Artificial Trees to Convert CO_2 to Fuel

Vivek Polshettiwar,

Nanocatalysis Laboratory, Department of Chemical Sciences, Tata Institute of Fundamental Research (TIFR), Mumbai, India. Email: vivekpol@tifr.res.in, www.nanocat.co.in

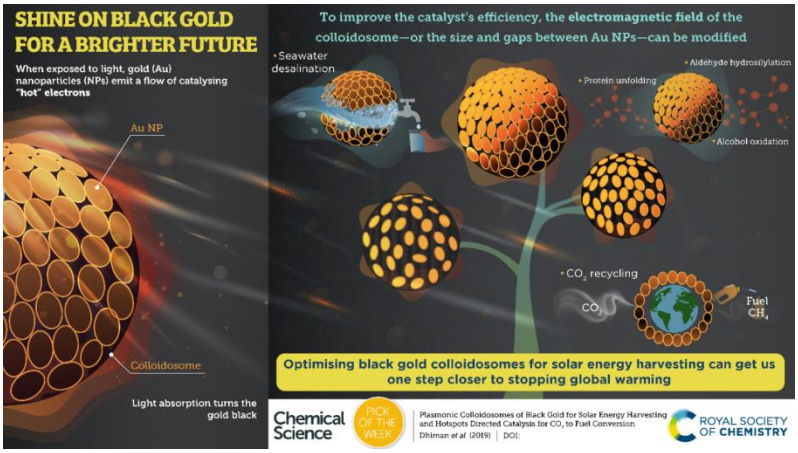
Global warming is a serious threat to the planet and the living beings. One of the main cause of global warming is the increase in the atmospheric CO_2 level. The main source of this CO_2 is from the burning of fossil fuels in our daily lives.

By using the techniques of nanotechnology, we have transformed yellow gold to black gold, by changing the size and gaps between gold nanoparticles. We achieved this by the concept of plasmonic coupling. Black gold absorbs light over the entire visible region as well as in the near-infrared region of the solar spectrum. Notably, black gold generates a large number of "hotspots" which can be used for CO_2 methanation reaction.

Similar to the real trees, which uses CO_2, sunlight, and water to produce food, the developed black gold acts like an artificial tree that uses CO_2, sunlight and water to produce fuel (which can be ideally used to run our cars). Notably, black gold can also be used to convert seawater into drinkable water using the heat that black gold generates after it captures sunlight.

This work is a way forward to develop "Artificial Trees," which capture and convert CO_2 to fuel and useful chemicals. Although at this stage, the production rate of fuel is low, in coming years, we may be able to convert CO_2 to fuel using sunlight at atmospheric condition, at a commercially viable scale, possibly using less expensive metal and CO_2 may then become our main source of clean energy.

I will discuss these results in my talk.



DR. RUPESH DEVAN

Nano-hetero-architectures: A step for improvement in the applicability

Rupesh Devan

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Enormous efforts have been made to synthesize and characterize one-dimensional (1D) and two-dimensional (2D) nanostructures. Both the 1D and 2D nanostructures in various forms have triggered a lot of excitement and expanded breakthrough achievement in all areas of electronics. The 1D nanostructure forms can enhance the unique properties of materials, making them suitable for a wide variety of applications such as gas sensors, smart windows, solar cells, light-emitting diodes, field emitters, and field-effect transistors. However, the 1D nanostructures do still have some drawbacks. For examples, in comparison with the bulk materials, the low dimension and small size make the melting points lower but the resistivity higher, so the thermal and chemical stability of the 1D nanostructures may be weakened. Our group is working to overcome these drawbacks and has explored the formation nano-hetero-architecture of 1D and 2D nanomaterials.

In this talk, I shall present our recent work on the synthesis of stoichiometric 1D nanostructures of metal oxides using physical vapor deposition techniques and hydrothermal approach. These nanostructures uniformly distributed on the Si-wafer and indium-tin-oxide (ITO) coated glass substrates were characterized by field-emission scanning electron microscopy (FE-SEM), energy dispersive spectroscopy (EDS), x-ray photoelectron spectroscopy (XPS), and x-ray diffractometry (XRD), etc. The prototype electrochemical display devices of these nanostructures demonstrated good coloration/bleaching ability, high coloration reversibility, long life cycle, and better stability because of its increased surface area. The 1D morphological features resulted in enhanced field electron emission with a lower turn-on field (i.e., 0.96 V/μm) along with high current stability. These functional properties were further enhanced after the formation of nano-hetero-architectures of 2D chalcogenide. At the end of, talk, I shall mention our most recent efforts on the transformation of 1D nanostructure into nano-hetero-architectures for further improvement in the performance of energy storage and conversion and displays.

DR. PRAVIN S. WALKE

The temperature and crystal structure dependent electrochemical performance of 1D and 2D metal oxide nanostructures for high energy density supercapacitor

Dr. Pravin S. Walke

National Centre for Nanosciences and Nanotechnology,

University of Mumbai, Mumbai-400098.

Abstract:

The next-generation e-vehicles, portable devices are demanding high energy density supercapacitors and/or high power density batteries with better life-spam. However, the performance sustainability of storage devices at various environmental conditions especially high-temperature stability is major anxiety. The design and development of novel architectures of smart materials at the nanoscale has great potential to overcome these challenges. Herein, I shall enlighten the efficacious growth of multilayered □-MnO_2 nanosheets and nanorods 3D architecture supported by carbon nanoparticle, which offered large surface area, high material density, opens interlayer space to accommodate more ions. The results show systematic enhancement in charge storage with increasing temperature by compromising little stability at the high current density and provide the fundamental understanding of thermally driven intercalation. In addition, the magical results of crystal structure dependent performance of layered WO3 nanossheets supercapacitor will be surveyed. The systematic tuning of charge storage capability with respect to various structures has been investigated. Overall this work provides important insights on how densely packed 3D structures comprise multilayered 2D sheets and 1D nanorods that affect the electrochemical properties with respect to temperature and crystal structure.

ORAL PRESENTATION

Synthesis and characterization of silica aerogel composite with a nano-filler Cobalt nitrate by supercritical drying method

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ABSTRACT

We report the investigation of synthesis of silica aerogel composite by reinforcing metal oxide particle cobalt nitrate hexahydrate [$Co(NO_3)_2.6H_2O$)] as a nanofiller into SiO_2 matrix. in silica matrix with the help of tetraethoxysilane(TEOS),ethanol and oxalic acid catalyst ,using sol-gel technique followed by high temperature(N_2 gas) solvent extraction with supercritical drying technique. The obtained aerogel doped with cobalt nitrate displayed a well developed porous structure, excellent physical properties with less volume shrinkage, extremely high specific surface area, average pore size. The cross-linked aerogel composite, structural and physical properties were investigated by XRD(X-ray diffraction), field emission scanning electron microscopy (FE-SEM),transmission electron microscopy(TEM),thermo-gravimetric and differential analysis(TG-DTA),Fourier-transform infrared-spectroscopy(FT-IR)and Brunauer,Emmett and Teller (BET) and BJH nitrogen gas adsoption-desorption.

KEYWORDS: cobalt nitrate hexahydrate , supercritical drying technique, sol-gel technique.

"SYNTHESIS AND CHARACTERIZATION OF Cu – Zn FERRITES"

P.S.RAJEEV, B.K.SAKHARE, R.P.TANDEL, S.B.JADHAV

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ABSTRACT

Copper zinc ferrites with chemical formula, $Cu_xZn_{1-x}Fe_2O_4$ with x = 0.4, 0.6 & 0.8 were prepared by using Standard ceramic method. The result of elemental composition of prepared ferrites is revealed by EDAX along with the density. The compositional characterizations of all the samples were done by Energy Dispersive Analysis of X-rays (EDAX). The confirmation of the single phase formation and the structural characterization were obtained by XRD method. The magnetic characterization as well as the transition temperatures from ferrimagnetic to paramagnetic state for all the samples were determined by measuring the relative a.c. susceptibility over a temperature range extending from room temperature to 600^0K.

KEYWORDS: Standard ceramic method, XRD, ferrite, EDAX etc.

Development of Hazardous gas detection system using Arduino R3

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ABSTRACT

Health Safety is one of the issues in current times and good safety systems are needed to be implemented in places which are related to work, education and living. As it is quite often that we heard about various accidents that are being occurred due to combustible gases, i.e., LPG, Carbon Monoxide, Methane, Hydrogen Sulphide and other flammable gases. Harmful gas leakage accidents are the main reason for workers death in industries. This paper is intended to avoid industrial accidents and to detect harmful gases using Arduino. The primary aim of the work is to design Arduino based hazardous gas detecting system using gas sensors. The hazardous gases like LPG, methane and carbon monoxide are sensed and when these gases exceed the normal level, LED for respective gas will glow and indicate through buzzer. The advantage of this system is that it offers as fast response time as possible and detection of the hazardous gases with accuracy and in turn helps by protecting lives of many workers.

KEYWORDS: Arduino R3, hazardous gases, LED etc.

SPECTRAL RESPONCES OF C.I.E.1964 R.G.B. DATA USING PYTHON

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ABSTRACT

Color is a psychophysical phenomenon and perception of color is subjective. [1] Tristimulus colorimetry is based on the three component theory of color vision, according to which the human eye possesses receptors for three primary colors i.e. R. G. B. Any color can be seen as positively weighted sum of these three primaries, in terms of the tristimulus values. The universally standard sets of these values are defined by C.I.E. In this work the various colorimetry aspects are studied by modulation and simulations. The chromaticity diagram is obtained and spectral characteristics are studied using simple Python Algorithm ,ColorPy and NumPy. MatplotLib is used to generate plots and Histograms.

KEY WORDS: Tristimulus colorimetry, C.I.E, ColorPy, MatplotLib etc.

µC based Fuel quantity and density measurement

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ABSTRACT

Now-a-days, we know that the fuel is being thieved at petrol stations. Various tricks are used to steal the fuel like a faulty meter, hose pipe longer than required, distracting the customers, etc. Also the fuel density is not correct at the fuel stations. There are chances of unfiltered fuel. People are not aware of this major problem. Due to this, a lot of economy of the customers is being wasted at fuel stations. Today in this digitized world, if the fuel indicator in the automobiles is also made digital it will help to know the exact amount of fuel available in the fuel tank and the density of fuel. The above furnished fact is considered in this work a proper solution is aimed for indicating the exact availability and density of fuel in the tank. The amount of fuel in the tank is indicated in liters and density of fuel in Kg/L. This work concentrates about the indication of fuel level in two- wheeler tanks.

To overcome the Fuel theft problem, load cell based fuel measurement gives exact level of fuel while Flow sensor measures density of fuel during fuel filling process. Monitoring of fuel level is attained by attaching the load cell below the fuel tank with the use of Arduino Uno and display unit is fixed with dash board.

KEYWORDS: Load cell, Flow sensor (YF-S201), ATmega328 microcontroller (Arduino Uno R3) etc.

Quantum Dots Dispersed Liquid Crystal System: Influence of Dispersion on Optical and Thermal Properties

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ABSTRACT

Liquid Crystal-quantum dots composites are promising new materials for a number of applications in displays, energy harvesting, and photonics. The present paper is an attempt to study thermal and optical properties of quantum dots dispersed in Liquid Crystal systems by various techniques. The thermal investigations were performed by Differential Scanning Calorimetry (DSC) and the enhancements in visible absorbance of liquid crystal system were investigated by Ultraviolet–visible (UV-VIS) Spectroscopy. The fastening optical response in terms of phase transition temperature has been observed by Fabry-Perot Scattering Studies (FPSS) were confirmed by Polarizing Optical Microscopy (POM). The dispersion of quantum dots not only increases the inherent strength of the material but also changes phase behavior. Doping increases the performance of the liquid crystal system. These studies would be very helpful for design of display and photonic devices having good optical response.

KEYWORDS: Quantum dot, liquid crystal, Polarizing Optical Microscopy, Fabry-Perot Scattering

XRD peak profile analysis of rare earth doped ZnO nanoparticles to estimate the lattice strain

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ABSTRACT

Tb doped ZnO nanoparticles were synthesized using sol gel method. Systematic structural studies on Tb^{3+} ion doped ZnO nanoparticles were carried out using X-ray diffraction, X-ray photoelectron spectroscopy and photoluminescence studies.Our XRD study shows a contraction effect as the dopant ion concentration is increased. FromX-ray peak analysis, Williamson-Hall (W-H) and Size-Strain Plot (SSP) methods were applied to examine the effects of crystallite size and lattice strain on the peak broadening of the ZnO nanoparticles. Based on the calculations, the estimated crystallite sizes and lattice strains obtained are in good agreement with each other.The strain calculated from XRD profile (using Uniform deformation model UDM) show an increase in the stress with the increase in Tb doping concentration which reveals the deformation of the host lattice. Surface area and dislocation density values are also observed to follow the same trend.

KEYWORD: ZnO, dislocation density, Williamson hall plot, UDM model

Synthesis, Characterization and Nitrogen Dioxide Sensing Properties of Polypyrrole Thick Films

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ABSTRACT

Nitrogen dioxide (NO_2) is an air pollutant that reacts in the air to form corrosive nitric acid and toxic organic nitrates; hence the detection of NO_2 in low concentrations is very important for humans health. In this work, we present Polypyrrole (PPy) as a sensing material for NO_2 at room temperature. Polypyrrole (PPy) was synthesized by in-situ chemical oxidative polymerization method. Surface appearance characteristics of synthesized material were performed by scanning electron microscopy (SEM). The uniform globular microstructure of polypyrrole was observed under electron micrographs. X-ray diffraction (XRD) pattern confirmed the semi-crystalline nature of polypyrrole (PPy). Fourier transform infrared spectroscopy (FTIR) studies confirmed the presence of all characteristics absorption peaks reported in the literature. The DC electrical conductivity measured at room temperature by two probe method was found to be 1.389×10^{-2} S/cm. Layer of sensing material (PPy) was casted on the interdigitated electrodes (IDE). Sensing experiments were performed on these films with the injection of 50 ppm to 1000 ppm level of NO_2 at room temperature. The static response and recovery time of the sensor to nitrogen dioxide were recorded. It was found that the response time decreased from 131sec to 27 sec as the concentration of NO_2 increased from 50 ppm to 1000 ppm, while the recovery time increased from 109 sec to 931sec.

KEYWORDS: Polypyrrole, Chemical polymerization, SEM, FTIR, XRD, Electrical conductivity, Room temperature NO_2 sensor.

Development of Nutritious Khakhra – Nano Composite Blend As a Potential For Protein Source

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ABSTRACT

Snack foods, being one of the major food categories of the global health and wellness market, are becoming a major focus of new product development in the food industry. Generally, a snack is a smaller portion of food than our regular meal can consume between meals. Snacks are of different varieties can make quickly, satisfy the consumers, less perishable, more durable and more portable than prepared food. Khakhra is a very thin, crispy, crunchy, healthy and flavoured snack product usually served as a breakfast dish and mostly common in the Gujrat and Rajasthan. The present study was conducted to determine the sensory quality and nutrient content of khakhra prepared with the incorporation of rajma flour (Kidney beans) as a protein source and Beetroot as it is rich in calcium and iron and has many health benefits. This khakhra were prepared by using 700 g wheat flour, 300 g rajma flour and 400 gm beetroot paste along with some spices, and Schezwan seasoning is also used. This nutritionally enriched khakhra were evaluated organoleptically using nine point scale. It provides (211) Kcal energy, (4.7 g) protein, (46.7 g) carbohydrates, (0.6 g) fat, (2.7 mg) iron, (3.5 g) calcium, and (1.8 %) moisture as compared to control khakhra. Thus, the results of the present study suggest that the incorporation of Rajma flour and Beetroot paste improves the nutritional quality of the product.

KEY WORDS: Indian Traditional Snacks, Rajma flour, protein, Iron

SYNTHESIS AND CHARACTERIZATION OF PYRROLE/DBS/ PEG -PAPAIN POLYMER COMPOSITE

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ABSTRACT

The papain-pyrrole polymer composite was synthesized under influence of dopent DBS and additive PEG by using chemical method with $Fecl_3$ as oxidant at room temprature. The resultant polymer (ppy/DBS/PEG) with different weight ratio of papain and pure polypyrrole were characterized using XRD,FTIR and SEM. The average crystal size calculated by using scherrer's formula comes to 15.53 A^0. FTIR confirms, presence of pyrrole, papain, DBS and PEG. SEM image shows size of granules around 80-120nm.

KEYWORDS: pyrrole, papain ,DBS ,PEG etc.

Synthesis and Characterization of Polyvinyl Alcohol-Polypyrrole-Silver Nanocomposite Polymer Films

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ABSTRACT

In this paper, the preparation and characterization of Polyvinyl Alcohol-Polypyrrole-Silver Nanocomposite (PVA-PPy-Ag NC) films is described. The films prepared were conducting, free-standing, flexible and robust. Silver nanoparticles (Ag NPs) were synthesized from the aqueous solution of silver nitrate using trisodium citrate as a reductant. The casting solution for films was prepared by in-situ chemical oxidative polymerization of pyrrole in the presence of Polyvinyl alcohol and suspension of pre-synthesized silver nanoparticles. The absorption band at 424 nm in UV-Visible Spectroscopy of silver nanoparticles confirmed the formation of Ag nanoparticles. Scanning Electron Microscopy (SEM) studies revealed that spherical Ag NPs were produced with an average size of ~ 40 nm. The morphological analysis of the synthesized PVA-PPy-Ag nanocomposite films was carried out using Transmission Electron Microscopy (TEM), Ag nanoparticles were well dispersed and conjugated in PVA-PPy matrix was observed in TEM images. The structure of produced films was studied by Fourier transform infrared (FTIR) Spectroscopy and X-Ray Diffraction (XRD). X-ray diffraction analysis exhibited the crystalline nature of the silver nanoparticles with a face-centered cubic structure. The synthesized PVA-PPy-Ag nanocomposite films can be utilized as potential material for the fabrication of gas sensors.

KEYWORDS: Silver nanoparticles, Polypyrrole, PVA, Nanocomposites, Freestanding films

Design Of Cobalt Oxide Nanostructures And Their Application In Electrocatalytic Oxygen Evolution Reaction

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ABSTRACT

Developing low-cost and efficient oxygen evolution catalyst is a critical step to overcome the sluggish kinetics of water oxidation. Herein, we present a facile strategy to synthesis Co_3O_4 nanostructures with different morphology. By changing the cobalt salt precursor and using a cationic surfactant (CTAB), Co oxide nanoparticles with different shapes and morphologies can be synthesized using exactly the same synthesis procedure. The synthesized nanostructures exhibited various morphologies of Co oxide such as marigold flower like, urchin like structure and self-oriented flowers which are composed of nanoflackes, nanospikes and nanorods respectively with the average size of ~40-120 nm. BET adsorption-desorption isotherms displayed a type IV H3 isotherm/mesoporous for marigold flower like structure with the surface area of 86.43 m^2/g. The effect of the morphology on the electrochemical catalytic properties were also studied. The obtained Co_3O_4 is used as aelectrocatalyst for oxygen evolution (OER) and its electrochemical properties are evaluated by Linear Sweep Voltammetry (LSV) in 1M NaOH electrolyte. In alkaline solution, the marigold flower like Co_3O_4 exhibits the best activity towards oxygen evolution reaction, achieving a current density of 10 mA cm^{-2} at an overpotential of 330 mV, which is smaller than that of RuO_2 catalyst (371 mV). This clearly indicates that the developed catalysts are highly efficient towards oxygen evolution reaction which can be attributed to their unique nanostructures.

KEYWORDS: Morphology, Cobalt oxide nanostructures, oxygen evolution reaction (OER).

Preparation and Antibacterial Activities of Polyvinyl Alcohol-Polypyrrole-Gold Nanocomposites

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ABSTRACT

Herein, we report the synthesis of polyvinyl alcohol- polypyrrole-Gold nanocomposite (PVA-PPy-Au NC) by simple and inexpensive in-situ chemical oxidative polymerization. Monomer pyrrole was oxidized by iron trichloride as an oxidant, in the presence of colloidal solution of gold nanoparticles (Au NPs). The growth of monodispersed gold nanoparticles was achieved by reduction of chloroauric acid (HAuCl4) with sodium citrate. The synthesized nanocomposites were characterized by X-ray diffraction (XRD) for crystallinity, Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) for morphology, Fourier-Transform Infrared Spectroscopy (FTIR) for chemical structure. Morphological images of the films showed that Au NPs were embedded in the PVA-PPy matrix and the size of the Au NPs was found to be 15-25 nm. The amorphous nature of Polypyrrole and sharp peaks representing gold nanoparticles were observed in XRD spectra. Presence of all characteristic peaks in infrared spectroscopy confirms the constituents of the nanocomposite. Anti-microbial activity of the PVA-PPy-Au nanocomposites was investigated against Gram-negative and Gram-positive test microorganisms, namely Escherichia coli and Staphylococcus aureus. The agar cup method was used for the evaluation of Anti-bacterial activity. The more prominent effect was observed against Gram-positive organisms as compared to the Gram-negative organisms.

KEYWORDS: Gold nanoparticles, polyvinyl alcohol, polypyrrole, nanocomposite, antibacterial activity.

Study of Multilayer and Multi-Component Coatings Deposited Using Cathodic Arc Technique on H-13 hot work steel for Die-Casting Applications

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ABSTRACT

Die Casting process is used since long but even today, problems like erosion, corrosion, soldering and sticking affect tool life as well as the product quality. These molding tools undergo cyclic thermal loads from 90^{o}C during cooling to 600^{o}C during die casting resulting in deterioration of the surface quality and productivity. Application of Hard coatings using Physical vapor deposition technique has already proved itself as a better alternative in such severe conditions. In the present work, we have studied Chromium based multilayer CrN/Cr (M-CrN) coating and aluminium titanium based nano-layered AlTiN (N-AlTiN) coating for die casting applications. The coatings were deposited on H-13 steel substrate using Cathodic Arc Deposition (CA-PVD) technique. Structural properties of the coated samples were studied using XRD and SEM techniques. Tribological and mechanical properties of the coatings were studied using Calo-test and Micro-hardness test respectively. Chemical inertness of samples was examined using potentiostat in corrosive HCl solution. Thermal fatigue (TF)test was conducted by heating the sample to around 600^{o}C and sudden room temperature cooled to observe coating stability (crack-formation). After multiple TF cycles, N-AlTiN coated sample outperform M-CrN coated samples in terms of wear, oxidation and adhesion properties.Formation of oxide layer during the thermal fatigue reduces further oxidation of the coating and develops inert surface which could result in enhanced productivity and efficiency of the molding.

KEYWORDS: Coating adhesion, Die casting application, H-13 hot work steel, PVD coatings, Thermal fatigue, Wear rate.

Structural properties of Ag doped Cd Te nanoparticles by precipitation method

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ABSTRACT

This work deals with the synthesis and structural characterization of silver (Ag) doped CdTe nanoparticles which were prepared by using precipitation method and the samples werecharacterized by X-ray powder diffraction.The doping concentration varies from 0.1 - 0.3% of Ag atoms. X-ray diffraction (XRD) techniques were employed to study the structural properties of powder samples. It was found that the samples have a hexagonalcrystal structure highly oriented with the hkl values of (401) plane.The size of the particle is found tobe increased with increase in concentration of Ag.

KEYWORDS: II-VI semiconductors, cadmium compounds, Ag doped CdTe, X-ray diffraction (XRD).

Bandgap tuning and electrical properties of multilayer ZnSe thin films

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ABSTRACT

Zinc Selenide (ZnSe) is a II-VI semiconductor having band gap of around 2.7eV. ZnSe thin films were deposited by e-beam thermal evaporation method with different thickness of 50nm to 150nm.Optical properties of the synthesized films were investigated by UV-VIS spectrometer in the wavelength range of 200-1000 nm.Energy band gap of thin films were investigatedand variations in the thickness were observed.The band gap results show the semiconducting nature of films grown. The increase in wavelength will decrease the absorbance in ZnSe thin film. Structural properties of the films have also been studied using XRD technique. Electrical properties can be studied by using I-V characteristic and hall measurement technique.

KEYWORDS: ZnSe, UV-VIS, XRD, Hall measurement, IV, Bandgap.

Investigation of optical and electrical properties of multilayer thin films of ZnSe/ZnTe/CdSe

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ABSTRACT

Zinc Selenide (ZnSe), Zinc Telluride (ZnTe) and Cadmium Selenide (CdSe) are II-VI semiconductor having band gap of around 2.7eV, 2.27eV and 1.74eV respectively.In present work multilayers ZnSe/ZnTe/CdSe thin films have been prepared by e-beam evaporation; having thickness 150nm to 300nm. Optical properties of the films were investigated by UV-VIS spectrometer in the wavelength range of 400-1000 nm. The band gap results show the semiconducting nature of film grown. Electrical properties of thin films have also been studied by Current-Voltage (I-V) characteristic and hall measurement technique.

KEYWORDS: ZnSe/ZnTe/CdSe, UV-VIS, I-V, Hall measurment, Bandgap.

Magnetic and Optical properties of $Fe_{13}O_8@Zn_{48}X_{48}$ core@shell clusters (X=O, S, Se) : Density Functional Theory Study

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ABSTRACT

Within the framework of Density functional theory (DFT), we have performed the first principles calculations to systematically study the magnetic and optical properties of $Fe_{13}O_8@(ZnX)_{48}$ (X = O, S, Se) core@shell clusters. Here, we have considered the stable magic iron oxide cluster[1, 2] $Fe_{13}O_8$ with D_{4h} symmetry as a core material and Zinc oxide[3, 4] $(ZnO)_{48}$, Zinc Sulphide $(ZnS)_{48}$ and Zinc Selenide $(ZnSe)_{48}$ globular onion-like nano-cluster as a shell. It has been found that for magic stable $Fe_{13}O_8$ cluster magnetic moment is 42 μ_B. With non-magnetic $Zn_{48}O_{48}$ shelling upon $Fe_{13}O_8$, the magnetic moment of the core@shell cluster enhances to 44 μ_B. The energy gap between the highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) of $Fe_{13}O_8@(ZnO)_{48}$ cluster decreases to 0.57 eV as compared to HOMO-LUMO gap of the pristine $Fe_{13}O_8$ (1.79 eV) and $Zn_{48}O_{48}$ (1.85 eV) clusters. Intensity of absorption spectra found to be increased due to core@shell formation. On the similar basis, we have also studied the effects of other zinc based $(ZnX)_{48}$ nanoclusters as a shell material, where (X = S, Se). Our first-principles results shows that, core@shell $Fe_{13}O_8@Zn_{48}O_{48}$ clusters is more stable as compared to that of (ZnS) and (ZnSe) clusters. For $Fe_{13}O_8@(ZnX)_{48}$, it is found that the intensity of the core@shell nano-cluster is high for $Zn_{48}O_{48}$ as compared to that of $Zn_{48}S_{48}$ and $Zn_{48}Se_{48}$ in lower energy region. Magnetic moment of $Fe_{13}O_8@Zn_{48}X_{48}$ (where X = S, Se) clusters quenches from 42 μ_B to 34 μ_B. These results indicates interesting possibility of combining magneto-optical behaviour to obtain multifunctional[5, 6] core@shell nanostructures.

The structural, electronic and optical properties of In-doped ZnO monolayer : A first principles study

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ABSTRACT

We have studied the structural, electronic and optical properties of indium (In) doped ZnO monolayer using density functional theory (DFT). We have used VASP code with Projected Augmented Wave (PAW) pseudopotentials [1] and generalized gradient approximation-Perdew, Burke and Ernzerhof (GGA-PBE) [2] functional. We have considered the different concentrations (6.25, 12.50 and 18.75 atomic (at.) %) of In atom in ZnO monolayer. The substitution of Zn atom with In, induces the structural deformation in ZnO monolayer. The bigger sized In atom (1.62 A^0) as compared to that of Zn (1.33 A^0), prefers to protrude out from the plane of ZnO monolayer. Earlier DFT calculations using CASTEP code with ultrasoft potential and PBE exchange correlation functional [3] showed that there is no structural distortion in ZnO monolayer with the doping of In atom. In atom remains in the plane of the ZnO monolayer. Similar behavior of In atom in ZnO monolayer was observed with FLAPW-GGA approach [4, 5] using WIEN2K code. With our computational model, we found that, protrude configuration is energetically more favorable compared with in-plane configuration for In doped ZnO monolayer. The computational methodology, potentials, exchange correlation functionals and codes are playing important role in investigating the structural properties. The structural deformation modulates the electronic and optical properties of In doped ZnO monolayer dramatically. With the increase in concentration of In in ZnO monolayer the magnetic moment of doped ZnO monolayer oscillates between 0 to 1 μB. To get more accurate band structure and band gap, we have applied Hubbard approach (DFT+U). The calculated band gap of ZnO monolayer is 2.73 eV. As concentration of dopant increases, there is gradual increase in degenerate energy levels of In at the bottom of conduction band. This results in significant reduction in the band gap of ZnO monolayer. With the increase in concentration of In atoms from 6.25 -> 12.50 -> 18.75 at.% in the ZnO monolayer the band structure shows the variation from semiconducting to half metallic to metallic behavior. We have found that, calculated work function and polarizability of In doped ZnO monolayer decreases compared with ZnO monolayer. The optical absorption spectra for In doped ZnO monolayer shows red shift compared with pristine ZnO monolayer. The dielectric constant of In doped ZnO monolayer increases compared with ZnO monolayer. The absorption spectra for protrude In doped ZnO monolayer shifts more towards the visible range compared with in-plane configuration. Our calculations showed that, the potentials and functional are playing important role in precise detection of structural and electronic properties.

Preparation & Characterization of Cd-doped SnO_2 thin films using PVD Method

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ABSTRACT

Tin oxide is used as a base material and cadmium as a dopant. In this study, flint glass substrates (Blue Star) have been used. Substrates were cleaned thoroughly in liquid detergent to remove oil and dust followed by hot chromic acid and distilled water. The film samples were prepared by evaporating tin wire and a lump of cadmium in vacuum of about 10^{-5} Torr by PVD technique. The film samples so prepared were then annealed at 300°C, 400°C and 500°C. They were characterized by various techniques such as XRD, FESEM, EDAX, etc. to study the structural, morphological parameters, elemental composition of the films respectively. Locally fabricated Static Gas Sensing system was employed to study the electrical as well as gas sensing properties of the film samples.

KEY WORDS: Cd-doped tin oxide, doping, gas sensing, PVD technique, Tin oxide.

Synthesis and characterization of undoped and silver doped zinc oxide nanoparticles

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ABSTRACT

In present study undoped and silver doped zinc oxide nanoparticles were synthesized by wet chemical precipitation method. The study has been done to study change in morphology of zinc oxide nanoparticles after silver doping. The structure of the sample was studied by x ray diffraction spectroscopy (XRD). It was clear from the x ray investigations that the structure is of the wurtzite hexagonal type and the grain size decreases by silver doping. The morphology of the samples is done by scanning electron microscopy (SEM).The morphology of the undoped zinc oxide nanoparticles is flower shaped. Once it is doped with silver there is change in morphology of synthesized zinc oxide nanoparticles from flower shape to rod shaped nanoparticles. As the properties exhibited by nanoparticles are dependent on its size and shape. Here it is interesting to study the dependance of shape on doping.

KEYWORDS: zinc oxide nanoparticles, silver doped ZnO

Studies on structural characteristics of Ag:CdTe nanoparticles by precipitation method

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ABSTRACT

This work deals with the synthesis and structural characterization of silver (Ag) doped cadmium telluride(CdTe) which were prepared by using precipitation method and the samples were characterized by X-ray powder diffraction. The doping concentration varies from 0.1 - 0.3% of Ag atoms. X-ray diffraction (XRD) techniques were employed to study the structural properties of powder samples. It was found that the samples have a hexagonal crystal structure highly oriented with the hkl values of (401) plane. The size of the particle is found to be increased with increase in concentration of Ag.

KEYWORDS: II-VI semiconductors, cadmium compounds, Ag doped CdTe, X-ray diffraction (XRD).

Gas Sensing Performance of Titanium Dioxide Thin Film Prepared By Spray Pyrolysis Technique

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ABSTRACT

Spray pyrolysis technique was employed to prepare nanocrystalline TiO_2 thin film. To prepare nanocrystalline TiO_2 thin film by using solution of AR grade Titanium chloride ($TiCl_3$, 0.05 M). The solution was sprayed on quartz substrate heated at 350^0C temperature to obtain the film. This thin film was annealed for a one hours at 550^0C. As prepared thin film was characterized by X-ray diffraction, Microstructure properties study was conducted using Transmission Electron Microscopy. The sensing performance of this thin film was tested for various gases such as LPG, H_2, CO_2, Ethanol, NH_3 and Cl_2 (500 ppm). Gas response, selectivity, response and recovery time of the sensor were measured and presented.

KEYWORDS: Spray pyrolysis techniques, TiO_2 thin film, gas sensor.

Thermal, structural Properties of $BaSrSiO_4$ Phosphor Prepared via Solid State Diffusion Method

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ABSTRACT

In this paper solid state diffusion method was used to prepare $BaSrSiO_4$ phosphors. The raw materials Strontium carbonate ($SrCO_3$), Barium carbonate ($BaCO_3$) and silicate (SiO_3) are used to prepare $BaSrSiO_4$ Phosphor and its properties were studied. The thermal behavior of prepared stiochiometric, homogenous mixture of $SrCO_3$ and CeO_2 studied by Thermogravimetric (TG), differential thermal analysis (DTA) and Differential scanning calorimetry (DSC). Dimond TG/DTA thermal analyzer was used for obtaining the TG, and DTA curves at NCL Pune. The initial weight of sample taken for recording the TG/DTA curves was 44.892 mg and heating rate was maintained at 10 $^oC\ min^{-1}$. From TG It indicates that the $BaSrSiO_4$ phosphor formation reaction is over by 1011.25 ^oC. From XRD patterns the calculated average crystallite size of the $BaSrSiO_4$ phosphor is 49 nm and the structure was orthorhombic. The SEM images the fine $BaSrSiO_4$ powder consists of small spherical particles with smooth and round surfaces

KEYWORDS: XRD, solid state diffusion method, Thermogravomatric, Phosphor SEM.

Structural, Electrical, Thermo-electrical and Optical Properties of Indium doped Lead Selenide Thin Films Deposited By Physical Evaporation Technique

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ABSTRACT

Thin films having different thickness 1000- 3000 A^0 of $Pb_{1-X}In_XSe$ (X=0.2) were deposited by thermal evaporation techniques, onto precleaned amorphous glass substrate. The optical microscopy and XRD were used to detect the structural properties of the films. The electrical, thermoelectric and optical properties of annealed thin films have been evaluated. From electrical properties bulk resistivity, mean free path, charge carrier concentration, mobility were calculated. The calculated value of bulk resistivity is 1.6647 x 10^{-4} Ω-cm, mean free path is 2.348 A^0, charge carrier concentration is 5.8941 x 10^{21} cm^{-3} and mobility is 0.0113 x 10^3 cm^2/volt-sec. Thermoelectric Properties shows a positive sign exhibiting p- type nature of films. Fermi energy and scattering parameter were determined. The calculated values of Fermi energy and scattering parameter are 0.02 to 0.16 eV and 0.26 to 0.143 respectively. The evaluated absorption coefficient and extinction coefficient were (1-4) x 10^5 and (2.5 - 9.07) x 10^{-3} respectively. The evaluated direct and indirect optical band gaps are 1.71 to 1.75 eV and 0.816 to 0.819 eV respectively

KEYWORDS: XRD, SEM, EDAX, electrical, thermoelectric and optical properties.

Hydrogen Gas Sensor Based On Nanocrystalline Titanium Dioxide Thin Film Prepared By Simple Spray Pyrolysis Technique

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ABSTRACT

spray pyrolysis technique was employed to prepare nanocrystalline TiO_2 thin film.. To prepare nanocrystalline TiO_2 thin film by using solution of AR grade Titanium chloride ($TiCl_3$, 0.05 M). The solution was sprayed on quartz substrate heated at 350^0C temperature to obtain the film. This thin film was annealed for a one hours at 550^0C. As prepared thin film was characterized by X-ray diffraction, Microstructure properties study was conducted using Transmission Electron Microscopy. The sensing performance of this thin film was tested for various gases such as LPG, H_2, CO_2, Ethanol, NH_3 and Cl_2 (1000 ppm). Gas response, selectivity, response and recovery time of the sensor were measured and presented.

KEYWORDS: Spray pyrolysis techniques, TiO_2 thin films, Hydrogen gas sensor.

Study of Spray Deposited Cadmium Indium Sulphide Thin Films

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ABSTRACT

Cadmium indium sulphide thin films have been deposited onto amorphous glass substrates using spray pyrolysis technique. The aqueous solution of Cadmium, Indium and Sulphide in the volumetric ratio 1:2:4 have been used to obtain good quality thin films deposits at various substrate temperatures. The preparative parameters such as substrate temperature, concentration etc have been optimized by photo-electrochemical (PEC) technique. The films were characterized by techniques such as X- ray diffraction and Scanning electron microscopy (SEM).The PEC characterization shows that both short circuit current (I_{sc}) and open circuit voltage (V_{oc}) are at their optimum values at the optimized substrate temperature of 360 ^{0}c and concentration (0.05 M). The XRD pattern shows that the films are nanocrystalline with spinel cubic structure. The films at optimized temperature have well formed grains as evidenced from SEM.

KEYWORDS : Spray pyrolysis; Thin films; PEC characterization ; XRD; SEM techniques

Green synthesis of hexagonal ZnO nanoparticles using peels of stinking passion fruit for efficient degradation of organic dyes

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ABSTRACT

The wastewater from some dye industry is directly surplus into surface water lacking any management. All chemical dyes that attachment with the fabric, providing and retaining more affluent color during washing and exposure. The cationic Methylene blue (MB) and rhodamine B dyes (Rh-B) were degraded from waste water used by textile industries. ZnO nanoparticles (NPs) synthesized by Ultrasonication in combination with green method in the presence of a Stinking passion fruit peels. UV-visible spectra confirms the synthesis of ZnO NPs. PL spectra and DLS measurements show that low intensity for photocatalysis and stable and negatively charged hydrodynamic molecule nature of ZnO NPs. The particle size, charge on nanoparticles, bonding nature, type of planes and crystallinity of ZnO analyzed by XRD, DLS, Zeta potential, FTIR, FEG-SEM, EDAX and TEM. TGA study shows high thermal stability of surface modified ZnO catalysts. ZnO NPs is found to be more stable (upto 410^{o}C) with 96.67% residue. Results exposed that 94.12% and 93.27% MB and Rh-B degradation was observed using surface modified ZnO NPs. From kinetic study of photodegradation of MB and Rh-B dye was found to be pseudo-first-order.

KEYWORDS : Pollution, washing, dye, nanoparticles, analyzed, photodegradation.

An Insight into variation of structure of nickel substituted cobalt ferrites with method of synthesis.

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ABSTRACT

Nanocrystalline Nickel-substituted cobalt ferrite nano-particles $Ni_xCo_{1-x}Fe_2O_4$ (x=0.2,0.5,0.8) are synthesized using sol–gel autocombustion method. X-ray diffraction (XRD) and transmission electron microscopy (TEM) are effectively utilized to investigate the different structural parameters. X-ray diffraction technique confirm the formation of nano-sized particles of cubic spinel structure for all samples. Lattice parameters, density, particle size and inhomogeneity are determined while Attenuated total reflectance (ATR-IR) spectroscopy and scanning electron microscope, transmission electron microscopy (TEM)images are studied. TEM images show that the spherical shape of particles size in the range of 49 nm and consistent with XRD result. The ATR-IR spectra show transmission peaks, in the range around 600$cm^{-1}$and 400 cm^{-1}which respectively arise from tetrahedral and octahedral interstitial sites in the spinel lattice and indicating a reported cationic exchanges between the lattices.

KEYWORDS: Nickel Cobalt ferrite nanoparticles, spinel, IR spectroscopy, Scanning Electron Microscope, transmission electron microscopy (TEM).

Thermally Stimulated Discharge Conductivity of PS: PVC Polyblend thin films

Meeta Saxena

Department of Physics, Sophia College for Women, Mumbai

ABSTRACT

D.C. electrical conductivity of MNA doped polystyrene (PS) and Poly vinyl chloride (PVC) thin films (~46.14 µm thick) thermos – grams were studied. Thermally Stimulated Discharge Conductivity (TSDC) has been carried out in the temperature range 303^0K to 403^0 K at five different polarising fields (6, 12, 15, 18 & 24KV/cm). Results are discussed on the basis of mobility of charge carriers in the sample. Thus, present study reveals that both the temperature and addition of dopant influence the d.c. electrical conductivity of undoped and doped Polyblends samples.

KEYWORDS: TSDC, PS, PVC, Thermo electrets.

Thermal and Vibrational Studies of Glutamine doped LaF_3: Dy nanoparticles

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ABSTRACT

Co precipitation method has been employed to synthesize Glutamine doped LaF_3:Dy nanoparticles. The Thermogravimertric analysis (TGA) and Differential thermal analysis (DTA) of the sample has been done.The FTIR Spectrum and FT-RAMAN spectrum of the synthesized nanoparticles has been studied.

Synthesis, crystallographic and magnetic properties of Ni doped Magnesium ferrite nanoparticles

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[b]*Department of Physics, Karnataka Science College Dharwad, India.*

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ABSTRACT

The present work focuses on the synthesis, structural, microstructural and magnetic studies of the nanocrystalline nickel doped magnesium ferrite ($Mg_{0.6}Ni_{0.4}Fe_2O_4$). The sample of $Mg_{0.6}Ni_{0.4}Fe_2O_4$ nanocrystalline spinel ferrite has been synthesized by sol-gel auto combustion method using citric acid ($C_6H_8O_7$) as a fuel, the prepared sample was sintered at 600 ˚C for 5 hrs. The structural properties were estimated from X-ray diffraction (XRD) studies. The microstructural studies were investigated through Field Emission Gun Scanning electron microscopy (FEG-SEM) technique. X-ray patterns confirmed the formation of single phase cubic structure. The magnetic properties were investigated by vibrating sample magnetometer. The crystallite size of synthesized ferrite nanoparticle is within the range of 10-35 nm. The saturation magnetization was 27.43emu/g.

KEYWORDS: Nanocrystalline, sol-gel, XRD, FEG- SEM.

Microwave Absorbing Properties of Copper doped Nickel Ferrite Nanoparticles

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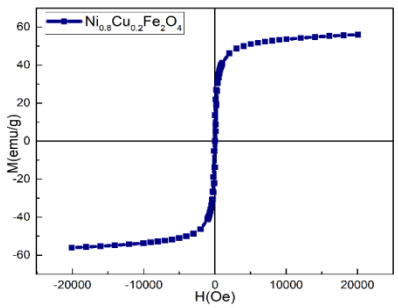
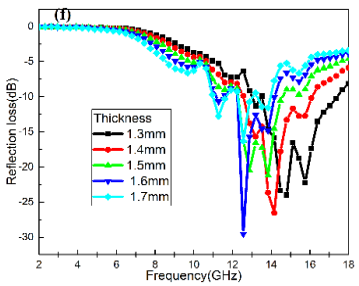
ABSTRACT

Ni-Cu ferrite nanoparticles with the compositional formula $Ni_{0.8}Cu_{0.2}Fe_2O_4$ was synthesized by sol-gel auto combustion method using lemon juice as a fuel. The prepared sample was characterized by X-Ray diffraction, Field emission gun scanning electron microscopy The XRD patterns clearly exhibited the formation of spinel structured $Ni_{0.8}Cu_{0.2}Fe_2O_4$ ferrite nanoparticles and FEG-SEM image depicted the uniform morphology of particles with the average sizes of 30 - 86 nm. The magnetic properties of the sample was studied at room temperature by Vibrating Sample Magnetometer (VSM) saturation magnetization of the powder was. 56.21emu/g. Complex permittivity and complex permeability were measured in the frequency range 2 GHz to 18GHz by vector network analyzer. The microwave absorbing properties of $Ni_{0.8}Cu_{0.2}Fe_2O_4$ ferrite nanoparticles were studied with the help of reflection loss. The excellent microwave absorption performance was found with the maximum reflection loss -29.57 dB in 12.56 GHz at thickness 1.6mm.





Synthesis and Characterization of Mn-Co Mixed Metal Oxide Electrode for Supercapacitor Application

Nidhi Tiwari[a], Snehal Kadam[a],Jayshri Patil[a], Pavan Khadekar[a], Harshita Shenoy[a], Ganesh Nagarvani[a] & Shrinivas Kulkarni[a*]

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ABSTRACT

Transition metal oxides have recently emerged as a promising electrode material for supercapacitive applications. In this perspective, a worldwide research has been reported to address this and rapid progress has been achieved in the advancement of fundamental as well as the applied aspects of supercapacitors. In the present work, we have synthesized Mn-Co mixed metal oxide by using simple Electrodeposition method on stainless steel substrate. The resulting electrodes were analyzed by using X-ray diffraction spectroscopy (XRD), scanning electron microscopy (SEM) and electrochemical characterization techniques like cyclic voltammetery(CV), galvanostatic charge discharge(GCD) & electrochemical impedance spectroscopy(EIS). The Mn-Co electrode material deposited on stainless steel substrate exhibited a maximum specific capacitance of 548.70 F/g at a scan rate of 5mV/s in 1M NaOH as an electrolyte. Also, Mn-Co electrode posses an excellent cyclic stability upto 1000 cycles at scan rate of 100mV/s. These results show that electrochemically synthesized Mn-Co on the stainless steel substrate is an inordinate electrode material which is most appropriate for supercapacitor application. The obtained results demonstrate that Mn-Co mixed metal oxide electrode material of higher specific capacitance and better cycling stability has enormous application potential for supercapacitors.

PHYSICO-CHEMICAL ANALYSIS OF SOIL SAMPLE AT DOLVI VILLAGE, TAL. PEN, DIST. RAIGAD, (M. S.), INDIA

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Abstract:

The natural environment is clean, but due to multifarious activities of man, it gets polluted resulting in what is called environmental pollution. In the present study it was preferred to investigate the soil samples for its physico-chemical analysis of some parameters. Four representative samples were obtained during October 2018 to October 2019 from Dolvi village Tal.Pen Dist.Raigad and analyzed in the laboratory. In the study area some Physico-chemical parameters are positively affecting on plantation except few parameters like Iron. High level of Fe reduces the availability of manganese for plant growth. Regular monitoring of physico-chemical parameter of soil is essential with respect to plantation and crop yield in the study area. This will helpful to the farmers.

Keywords: Physico-chemical parameters, Dolvi village, pH, soil temperature.

Chemical Bath Deposition and Characterizations of CdSe Thin Films Deposited at Different Temperatures

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Abstract:

CdSe thin films were deposited using chemical bath deposition by maintain the bath at 20 °C, 40 °C, 60 °C and 80 °C temperatures. These films were then characterized for their crystallinity, morphology and optic properties. There was a significant difference in crystallinity and the energy band gap. The surface morphologies of the thin films did not show considerable difference.

Keywords: CdSe, Crystallinity, Energy Band Gap, Surface Morphology and EDS.

Biosynthesis and characterization of ZnO nanoparticals by Annona Reticulata Seeds

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Abstract:

Development of green nano technology is producing attention of researchers near eco-friendly biosynthesis of nano particle. Many foundations were discovered for the synthesis of ZnO nanoparticles. In this study, biosynthesis of ZnO nanoparticle was done using Annona Reticulata seed extract. Seed extract was mixed with Zn nitrate and we observe the change in colour from deep yellowish to white ZnO NPs. These biosynthesized ZnO NPs were characterized with the help of X-ray diffraction, Infrared spectroscopy, UV visible spectra, Dynamic light scattering and SEM. SEM micrographs reveal the globular shaped agglomerated particles. UV visible and FTIR spectroscopy confirms the bonding in extract and NPs. DLS and zeta potential indicates size and charge on nanoparticles explore new area for reactions. Thus this method can be used for rapid and eco-friendly biosynthesis of ZnO NPs.

Keywords: technology, extract, color, ecofriendly

POSTER PRESENTATION

Optically engineered nickel oxide films as HTLs for planar inverted perovskite solar cells

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ABSTRACT

Inverted planar perovskite solar cells (PSCs) with nickel oxide (NiO) as a hole transporting layer were fabricated in an ambient atmosphere. Nickel (Ni) film synthesized at optimized evaporation conditions using low-cost thermal evaporation were transformed from island-like structure to compact porous thin films of NiO after oxidation at 580 °C. The formation of highly transparent NiO films without any impurity was confirmed from UV–visible spectroscopy and energy dispersive x-ray analysis. These optically tailored NiO films with island-like morphology conceived minimum absorption to the visible light than that of compact porous thin films. The NiO island-like films coated with single cationic $CH_3NH_3PbI_3$ perovskite overlayer in ambient conditions via a modified two-step method showed higher hole quenching than the compact porous NiO thin films. PSCs consisting of NiO island-like films showed 39.3% improvement in power conversion efficiency (PCE), and 41.4% enhancement in current density (J_{SC}) compared to the compact porous NiO thin films. Overall, the present approach of utilizing optically engineered island-like inorganic films with single cationic $CH_3NH_3PbI_3$ perovskite overlayer has opened up a novel approach toward the improvement in high-performance optoelectronic devices fabricated at an ambient atmosphere.

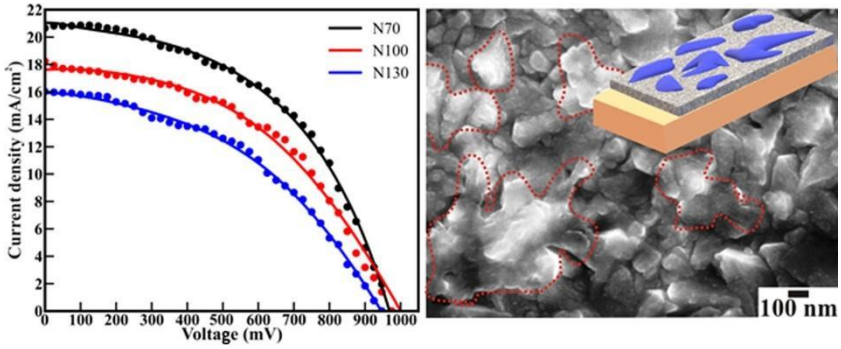

Figure: Graphical abstract

KEYWORDS: NiO, Islands morphology, Perovskite solar cells. Ambient process, Thermal evaporation, PL

Controlled hetero-architectures of Au nanoparticles decorated ZnO nanowires for enhanced field electron emission displays

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ABSTRACT

We revealed the field emission (FE) of Au nanoparticles decorated ZnO nanowires synthesized via hydrothermal and citrate reduction approaches. The spitzer shaped pointed ZnO nanowires of diameter 120nm and length ~5-6µm were decorated with Au nanoparticles of diameter <20nm along their textural boundaries. The turn-on field (E_{on}) of 1.56 V/µm required to draw current density of 10 µA/cm^2 from ZnO nanowires was further reduced to 0.96 V/µm after controlled decoration of Au nanoparticle, is significantly lower than pristine/doped ZnO nanostructures, Ag@ZnO, Au@ZnO, Au@CuO, and MoS_2@TiO_2 heterostructure based FE devices. The orthodoxy test confirmed the feasibility of field-enhancement factor (β_{FE}) of 4477 for Au/ZnO/ITO emitters. The enhanced FE behavior are attributed to pointednanotips, individual dispersion of Au nanoparticles along the textural boundaries of ZnO nanowires, and enhancement of the energy well formed at their interface. Moreover, the density of state increases enormously due to the hetero-structured interface of Au@ZnO and significant amount of electrons from both Au and ZnO contribute for enhanced emission current density (2.1mA/cm^2@1.92V/µm), and greatly stable electron emission with fluctuations of ± 4 %. Our experiments suggest that the tunable Au nanoparticles@ZnO nanowires hetero-architectures hold the promises for applications in display screens and intense electron source.

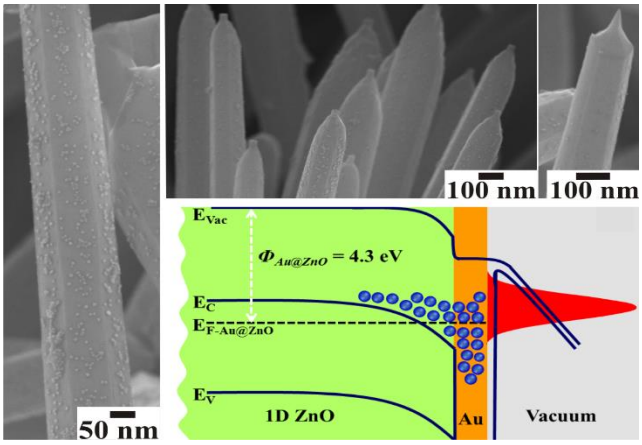

Figure: Graphical abstract

KEYWORDS: nano-hetero-architectures, Au@ZnO, spitzer shaped nanowires, XPS/UPS, and field emission displays

Morphology-Controlled mesoporous perforated NiO nanostructures for high energy density supercapacitor electrodes

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ABSTRACT

We report the morphology-controlled approach to improve the specific capacitance (C_s) and energy/power density of the supercapacitor. The randomly oriented irregular morphologies of NiO are converted into the perforated mesoporousnanobelts and further transferred into the nanoflakes under controlled reactions. The nanobelts and nanoflakes of NiO with an average width of ~74 nm and ~215 nm forms the thin film of thickness ~5.8 and 2.7 µm,respectively. The mesoporousNiOnanobelts deliver the high C_s of 794 F/g compare to the nanoflakes (146 F/g) and a thin film of irregular morphologies (742 F/g). Moreover, nanobelts show 88.6 % retention after continuous 2500 charging-discharging cycles. The NiOnanobelts exhibit the power density of 2963 W/kg, and energy density of 57 Wh/kg is significantly higher than the pristine NiOnanoflakes, nanorods, 2D thin films, porosity tunnednanowalls,nanofibers, and its heterostructures with $NiCo_2O_4$ and Ni_3S_2nanosheets. The perforated mesoporousNiOnanobelts with clearly visible textural boundaries provide relatively larger surface area and excellent interconnecting network than that of irregular morphologies and nanoflakes, which provide easy access to the OH^- ions for diffusion. This suggests that the perforated mesoporousNiOnanobelts hold the potential as electrode materials for the supercapacitor with ultra-high rate capabilities.

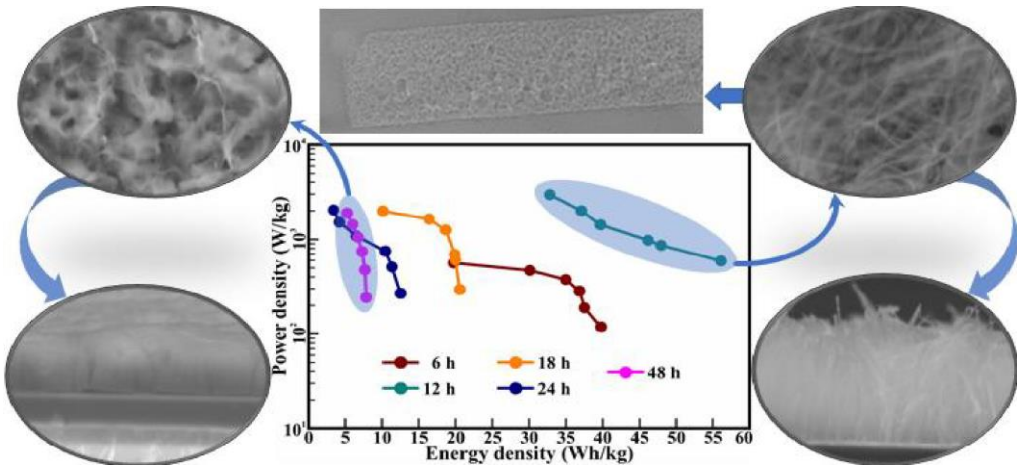

Figure: Graphical abstract

KEYWORDS: Mesoporous nanostructures; NiO; nanobelts; nanoflakes; supercapacitor; XPS; etc.

ZnS-rGO nanocomposites for photo-reduction of toxic Cr(VI) and photodegradation of methylene blue under natural sunlight

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ABSTRACT

A simple approach is described for the preparation of zinc sulfide-reduced graphene oxide (ZnS-rGO) nanocomposites using a single-source molecular precursor. The zinc sulfide has been synthesized using Zinc(II) benzaldehyde thiosemicarbazone complex. The ZnS-rGO was synthesized using above precursor in the coexistence of graphene oxide, using a solvothermal method. Zinc metal chalcogenalato complex and nanocomposites were characterized using various techniques. The ZnS-rGO nanocomposites were used for the chemical reduction of highly toxic Cr(VI) in the presence of formic acid as a reducing agent. The reduction of hexavalent to trivalent chromium is carried out at room temperature using natural sunlight within 80 min. Zinc sulfide-reduced graphene oxide nanocomposites exhibit enhanced photocatalytic degradation efficiency toward methylene blue (MB) dye using solar light irradiation.

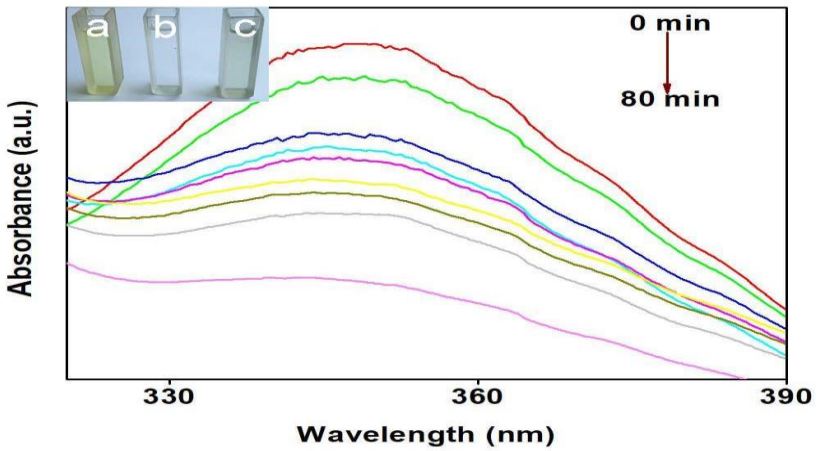

Figure: UV–Vis absorption spectrum for catalytic reduction of Cr(VI) to Cr(III) under solar light irradiation at a different time interval from without catalyst to 80 min and photographs of Cr(VI) to Cr(III) (a) Cr(VI) solution, (b) Cr(III) solution, and (c) after addition of excess NaOH solution (inset image)

Structural and Magnetic Properties of $Mn_{0.8}Co_{0.2}Fe_2O_4$ Ferrite Nanoparticles

Ravindra Kalesh[a], Ravindra N. Kambale[b], Krishnakumar Sagar[c], Vaishali Bambole[b*]

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[b]*Department of Physics, University of Mumbai, Vidyanagari Campus Kalin Santacruz Mumbai 400098, India*
[c]*Department of Physics, Karnataka Science College Dharwad 580001, India*

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

ABSTRACT

Cobalt doped Manganese ($Mn_{0.8}Co_{0.2}Fe_2O_4$) spinel ferrite nanoparticles have been synthesized by green sol-gel auto combustion technique with lemon juice. The prepared sample was sintered at 550˚C for 8 hrs. The structure and morphology of prepared sample were investigated by X-ray diffraction (XRD) and Field Emission Gun Scanning electron microscopy (FEG-SEM) technique. The X-ray diffraction pattern confirm the single phase formation and the crystallite size of synthesized $Mn_{0.8}Co_{0.2}Fe_2O_4$ferrite nanoparticles were found to be within the range of 20 - 55nm.The magnetic properties were studies by using vibrating sample magnetometer (VSM). The saturation magnetization, coercively, remanence, Bohr magneton and anisotropy constant (K) were calculated from the M-H hysteresis loop.

KEYWORDS: Nanoparticles, Saturation magnetization, anisotropy constant and FEG- SEM.

Application of CdS Thin Films in Photoelectrochemical Cell

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Viva College of Arts, Commerce and Science, Virar (W), Dist- Palghar

ABSTRACT

Thin films were prepared of CdS using chemical bath deposition technique on FTO substrate. The synthesizing temperatures of the films were varied from 25 °C, 45 °C, 65 °C and 85 °C. These films were used in the study of photo electrochemical cell application and hence open circuit voltage (Voc), short circuit current (Isc), fill factor (ff), conversion efficiency (η) were determined.

KEYWORDS: Chemical bath deposition, photoelectrochemical cell, open circuit voltage, short circuit current, fill factor and efficiency.

Preparation and Characterization of Copper Oxide Thin film by SILAR Method

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[2]Department of Physics, S.P.H. College, Malegaon-Camp, Dist-Nasik (M.S.), India.

[2]Department of Physics, L.V.H.College, Panchanvati, Nashik. (M.S.), India.

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ABSTRACT

Copper oxide thin film was prepared by Successive ionic layer adsorption and reaction (SILAR) technique. The Copper oxide thin film was fabricated on corning glass substrate at room temperature. The present work is aimed at studying the behaviour of copper oxide thin film which was annealed at 450 ^{0}C temperature for 2 hours in air atmosphere then its electrical characteristics was measured and its effect is discussed in this paper. The DC resistance of the film was measured by half bridge method in air condition at different temperature (Between 40 ^{0}C to 350 ^{0}C). Film shows increase in temperature with decrease in resistance of film indicating semiconductor behaviour. The TCR, activation energy, specific resistance of film was evaluated at 450 ^{0}C. Thickness of the film was measured by gravimetric method.

KEYWORDS: Silar, CuO, Thickness, Activation energy.

PMS study of Nanocomposites of Polymer dispersed Liquid Crystal

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msp605@gmail.com

ABSTRACT

Liquid crystals are widely used in display devices and optical switches. Recently, To enhanced physical properties of Liquid crystal materials. Nanocomposites of polymer dispersed liquid crystal is used. These materials possess combined applications of liquid crystal, polymer and nanomaterials. The Polymer dispersed liquid crystal is mixed with nanocomposites consists of different concentrations with each material .The phase transition and Textures can be studied by Polarizing Microscope studies (PMS).Our result will produce new opportunity and their uses in technology.

KEYWORDS: Liquid crystal,nanocomposites,polymer,PMS

Structural, Optical and Electrical Properties of $Hg_xCr_{2-x}S_4$ Thin Films Deposited By Chemical Bath Deposition Method (CBD)

*H.B.Patil[1], S.V.Borse[2]

[1]*Department of physics, R.C.Patel ACS College,Shirpur-425405(M.S.) India.*
[2]*Department of Physics, S. S. V. P. S, ACS, College, Shindkheda-425406, (M.S.) India.*

Email Id- h.patil7@gmail.com

ABSTRACT

In the present communication, the ternary $Hg_xCr_{2-x}S_4$(x=0.6) thin films were deposited by using a chemical bath deposition method (CBD).Thin film deposition was carried out at the optimized conditions (pH = 10±0.1, deposition temperature 65 °C, deposition time 120 min.).X-ray diffraction studies confirmed cubic structure cell and lattice parameters are reported.The SEM image of $Hg_xCr_{2-x}S_4$ (x=0.6) shows that surface is not smooth, spherical shaped large grains are clearly seen on the micrograph.The direct optical band gap of this sample was 2.36082eV.The dc electrical resistivity measurement shows that the $HgCr_2S_4$ thin films are semiconducting in nature with activation energy 0.254eV.

KEYWORDS: CBD, XRD, SEM, direct optical band gap, electrical resistivity.

Role of Nanotechnology in Effective Low Cost Sustainable Solar Energy Appliances

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ABSTRACT

The generation of energy to meet the increasing global demand should not compromise the environment and the future. Therefore, renewable energies have been identified as potential alternatives to fossil fuels that are associated with CO_2 emissions. Subsequently, photovoltaic (PV) solar system is seen as the most versatile and the largest source of electricity for the future globally Nanotechnology is a facilitating tool that offers a wide range of resources to resolve material challenges in different application areas. This studies X-rays, energy trilemma, potential nanotechnology-based materials for low-cost PV solar cell fabrication, and atomic layer deposition (ALD). In pursuance of improved performance, PV solar-cell technologies have revolutionized from first-generation PV solar cells to third-generation PV solar cells. The efficiency (19%) of second-generation PV cells is higher than the efficiency (15%) of first-generation cells. The second-generation PV cell technologies include a-Si, CdTe and Cu(In, Ga)Se2, Cu(In,Ga)Se2 (CIGS) cells. The third-generation PV cells are organic-inorganic hybrid assemblies, nanostructured semiconductors, and molecular assemblies. This nanocomposite-based technology aims at developing low-cost high efficiency PV solar cells.

Sonopant Dandekar Shikshan Mandali's College,Palghar-401404.

Department of Physics

I CAN$_{N\text{-}2019}$

International Conference on Advanced Nanomaterials & Nanotechnology-2019.

26-28 November, 2019,| MUMBAI, INDIA

Conference Budget-2019-20

Sr. No.	Heads	Income	Expenditure	References
1	Registration	2,29,500/-		Annexure-I
2	International Speaker		2,36,000/-	Annexure-II
3	National Speaker		64,000/-	Annexure-III
4	Participants		55,000/-	Annexure-IV
5	Printing		60,000/-	Annexure-V
6	Website design		10000/-	
7	Miscellaneous		10000/-	
	TOTAL	**2,29,500/-**	**4,35,000/-**	

Annexure-I: Registration

Registration	Registration fee		No .of Participants	
	Indian (Rs.)	Foreign ($)	Indian	Foreign
Academic/Industry	2000	100	50	05
Ph.D. Students	1500	70	40	05
PG/UG Students	1000	50	10	--
Total in INR			1,70,000/-	59500/-
Total in INR			2,29,500/-	

Annexure-II: International Speakers

Speaker	Air fare	Hotel (Lodging)	Travelling	Enumeration	Total
Prof. Kim Jong Kil Hanyang University, South Korea	80,000	10,000	8000	20,000	1,18,000
Prof. Yuan-Ron Ma National Dong Hwa University, Taiwan	80,000	10,000	8000	20,000	1,18,000
	1,60,000/-	20,000/-	16,000/-	40,000/-	2,36,000/-
Total: 2,36,000/-					

Annexure-III: National Speakers

Speaker	Air fare	Hotel (Lodging)	Travelling	Enumeration	Total
Prof. Vivek Polshettiwar TIFR , Mumbai	---	5000	8000	10,000	23,000

Annexure-II: National Speakers

Speaker	Air fare	Hotel (Lodging)	Travelling	Enumeration	Total
Prof. Vivek Polshettiwar TIFR , Mumbai	---	3000	5000	10,000	18,000
Dr. Pravin walke NCNN ,Mumbai University , Mumbai .	----	3,000	5000	10,000	18,000
Dr. Rupesh Devan IIT,Indore, MP	10,000	3,000	5000	10,000	28,000
	10,000	9,000	15,000	30,000	64,000

Total: 64,000/-

Annexure-IV: Participant Expenditure

No.of Participants	**Breakfast+ Lunch+ Tea**	**Kit**	**Certificate printing**
110	250 per head	200 per head	50 per head
Total	27,500/-	22,000/-	5500/-
Total : 55,000/-			

Annexure-V: Printing

Paper Publishing (Rs.800/paper)	**Banner and Flex**	**Brochure & Poster**
50,000/-(60 candidate)	5000/-	5000/-
Total: 60,000/-		

Dr. Kiran J. Save
Principal

DEPARTMENT OF PHYSICS

Event Overview

Date: 26/11/2019 to 28/11/2020

Venue: Sonopant Dandekar Arts, V.S. Apte Commerce, and M.H. Mehta Science College, Palghar

No. of Participants: 110

The "International Conference on Advanced Nanomaterials and Nanotechnology (I CANN-2019)" was jointly organized by the Department of Physics, Sonopant Dandekar Shikshan Mandali, Palghar and the Department of Physics, University of Mumbai. The conference took place from November 26th to 28th, 2019, at the Sonopant Dandekar Arts, V.S. Apte Commerce, and M.H. Mehta Science College in Palghar.

Mrs. Sapna Jadhav
Department of Physics