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EMNSD 2020

1st International Conference on

Evolving Materials and Nanotechnology for Sustainable Development (EMNSD-2020)

(Online Mode)

15-16 December 2020

ABSTRACT VOLUME

EMNSD 2020

Organised By,

Department of Physics,

Central Institute of Technology Kokrajhar,

Deemed to be University (under MHRD, Govt. of India),

Kokrajhar, BTR, Assam-783370, India.

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केन्द्रीय प्रौद्योगिकी संस्थान कोकराझार
CENTRAL INSTITUTE OF TECHNOLOGY KOKRAJHAR
Deemed to be University, MHRD, Govt. of India
Kokrajhar, BTAD, Assam 783370
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MESSAGE FROM THE DESK OF DIRECTOR

It gives me immense pleasure to share with you that the Department of Physics, Central Institute of Technology Kokrajhar (Deemed to be University, MHRD, Govt. of India), Assam is organizing International Conference on "Evolving Materials and Nanotechnology for Sustainable Development (EMNSD)" 15- 16 December, 2020 in on line mode. The topic is quite relevant and significant which includes most prominent dimensions of the study in the field of materials and nanotechnologies. Taking this fact into consideration, the CITK is going to adopt a step to create a healthy academic horizon which is urgently needed for all-round development of the nation with global standard. I welcome all esteemed speakers and participants to deliver their interesting & valuable talks in the conference EMNSD 2020.

I acknowledge efforts put by all organizing members. I wish a grand success.

With Best Wishes

Debkumar Chakrabarti

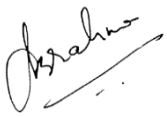
Prof. Debkumar Chakrabarti
Director (Officiating) CIT Kokrajhar

MESSAGE FROM THE DESK OF REGISTRAR

Greetings from CITK…

I am happy to say that the Department of Physics of Central Institute of Technology Kokrajhar (Deemed to be University, MHRD, Govt of India) is going to organize the International Conference on "Evolving Materials and Nanotechnology for Sustainable Development (EMNSD)" 15- 16 December, 2020 in on line mode. This conference will bring the wave of knowledge from different fields across the world along with the platform to interact, discuss the challenges and exchange the expertise towards building a possible collaboration. With this message, I am honoured and delighted to welcome you to attend this conference. I welcome each and every participants of the conference to feel the learning environment of CIT Kokrajhar and to make the event grant success.

I appreciate the hard work of the entire team, as well bringing out a Book of Abstracts highlighting the recent research outcomes in the related field. I wish great success for the successful conduct of the delightful event EMNSD 2020 and hope this mission will be carried out with even more dynamism in the years ahead.



Ms. Chaitali Brahma

Registrar, CIT Kokrajhar, Assam

FROM THE DESK OF HEAD OF THE DEPARTMENT

It involves extraordinary delight to take note of that the Physics Department CITK will put together the first International conference Evolving Materials and Nanotechnology for Sustainable Development (EMNSD-2020). It involves incredible pride that the coordinator of the conference has been effective in making a gigantic effect on the target participant within short span of time. The conference has got a staggering response across the globe which is essentially stunning. It is an incredible accomplishment for the organiser to arrange the publication of Abstracts in the form of a book having ISBN status.

On behalf of the Department and also on my personal behalf I would like to thank the organisers of EEMNSD-2020 for their untiring efforts and constant endeavour to make the conference new heights.

I wish EMNSD-2020 a grand success!!

Dr. B N Parida
Assoc. Prof. & Head,
Department of Physics,
CIT Kokrajhar, Assam, India

FROM THE DESK OF CONVENOR

I am so honored and delighted to take the opportunity to convey my best of regards to you all who have given your valuable time towards fulfilment of the **International Conference on Evolving Materials and Nanotechnology for Sustainable Development (EMNSD-2020) on 15-16 December 2020 (Tuesday-Wednesday)** in online mode via Cisco WebEx. I would like to welcome you all respected persons to the glorious moment for our CIT Kokrajhar. We are so happy to receive to have very good response from Eminent Persons across the globe as well as the nation along with our native places.

The aim of the conference is to tie the thought of researchers working in academia and other professionals through their research presentations in current technological trends. EMNSD 2020 is providing an excellent forum for exchange of ideas, scientific interactions and potential for collaboration in materials science with nanotechnology.

We have received a very good number of participants for both oral and poster presentation from wide-ranging area of materials and nanotechnology based on the theme of Sustainable Development. We are very much delighted to publish all those as a conference abstract book and selected full papers in form of conference proceeding with ISBN. We hope, these publications will be valuable and memorable assets for the contributors, host institutes and other Academic and Research bodies.

On the behalf of organizing committee of EMNSD 2020. I would like to extend our gratefulness to Prof. Devkumar Chakrabarty, Director, CITK, for approval cum strong encouragement. I am also very much obliged to Ms. Chaitali Brahma, Registrar, CITK for the support and cooperation in all dimensions. I would like to extend my sincere gratitude to all members of advisory board and also appreciate Dr. Bichitra Nanda Parida, Head of Department of Physics, CITK for continues stimulating cooperation. The programme would not be up to the mark without the full contribution of members of organizing committee, staffs, research scholars, speakers, delegates, participants, students, and all who have joined their hands directly or indirectly to make the event grand success. So, I am very much thankful to them from bottom of heart.

I hope all of us will have a great time with peer groups in this conference and would receive many great tips to implement those in your works. On behalf of organising committee I would like to convey our best wishes to you all and appeal you to make our conference a great success.

Dr. Manasi Buzar Baruah,

Convener, EMNSD-2020
Assistant Professor, Department of Physics
CIT Kokrajhar, Assam, India
Email id: emnsd20@cit.ac.in

EMNSD 2020

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EMNSD 2020

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Keynote Speakers

EMNSD 2020/KS/01

Genetic modification of a soybean gene for enhancing broad-spectrum disease and pest resistance in soybean

Madan K. Bhattacharyya[1], Micheline Ngaki[1], Feefei Wang[1], Subodh Srivastava[2]

[1]Department of Agronomy, Iowa State University, USA; [2]USDA-APHIS-PPQ, S&T-Beltsville Laboratory, Beltsville, Maryland, USA

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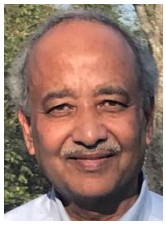
Abstract

Plants fight-off pathogens and pests by manifesting an array of defense responses using their innate immunity mechanisms. Plant nonhost immunity is wide-spread in nature, and it provides broad-spectrun and durable resistsance against most pathogenic organisms. We have applied a forward genetic approach and identified five Arabidopsis nonhost resistance genes, each governing an unque function. Each of these genes provides soybean enhanced immunity against *Fusarium virguliforme* that causes sudden death syndrome (SDS) in soybean. We have also shown that four classes of soybean genes are rapidly suppressed by *F. virguliforme* infection. Overexpression of three such soybean genes provides enhanced SDS resistance in transgenic soybean plants. One of the three genes is novel, and it encodes a plasma membrane protein. Interestingly, overexpression of this gene enhances resistance against not only against *F. virguliforme*, but also against spider mites (*Tetranychus urticae*, Koch), soybean aphids (*Aphis glycines*, Matsumura) and soybean cyst nematode (*Heterodera glycines*). We, therefore, name this protein as *Glycine max disease resistance 1* (*GmDR1*). We investigated if elicitor chitin, common to all these four pathogen and pests, can significantly influence the defense pathways among the *GmDR1*-overexpressed transgenic soybean lines. A transcriptomic study of two independent transgenic lines overexpressing *GmDR1* revealed that nearly 200 genes including 22 putative signaling disease resistance genes are induced by chitin. Our long-term transgenic studies revealed that broad-spectrum disease resistance can be created through genetic manipulation of nonhost and host resistance genes in soybean.

Keywords: nonhost immunity, broad-spectrum resistance, soybean, Arabidopsis

References: Ngaki, M. N., Sahoo, D. K., Wang, B. and **Bhattacharyya, M. K.** (2020) Overexpression of a plasma membrane protein generated broad-spectrum immunity in soybean. *Plant Biotechnol. J.*, https://doi.org/10.1111/pbi.13479

Biography of the Presenting Author: Bhattacharyya is a professor in the Department of Agronomy. Following completion of his graduate studies in Western University, London, Canada, he joined John Innes Institute, now John Innes Center, UK, for his post doctoral research. He then joined Noble Foundation, Ardmore, OK, where he initiated his research program in soybean. In 2000, he moved to Iowa State University. His research areas include host and nonhost disease resistance, abiotic stress and transposable element. He teaches *Applied Plant Molecular Genetics and Biotechnology* to graduate students.



EMNSD 2020/KS/02

Green Fabrication of Nanomaterials, and their applications in healthcare, agriculture, environment, energy and life sciences

Absar Ahmad

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Abstract

Nanotechnology dwells upon the changes in properties of bulk materials when at the nanoscale and is used to design different structures, geometries and devices for a wide range of applications. In a very short period of time, nanotechnology has emerged as one of the most important areas of research and development and shows considerable promise with regards to biomedical, chemical, catalysis, advanced materials, electronics, energy and drug delivery applications.

The present chemical nanosynthesis routes are toxic and require extremes of temperature while the physical routes are expensive and laborious. In contrast, biological routes for the synthesis of nanoparticles have recently been developed and yield nanoparticles at room temperature and physiological pH with properties such as high stability, water dispersal, fluorescence, etc. which are very difficult to achieve by chemical and physical routes. Furthermore, biologically synthesized nanoparticles are naturally protein capped, which prevents their flocculation, thus eliminating the need of any external capping agents which are usually toxic as is seen in chemical routes. Thus, the biosynthesis of nanoparticles is in complete synchronization with the environment and should be further developed in order to find major applications in cancer research, targeted drug delivery systems, treatment of cardiovascular disorders, etc.

In this talk, we describe our research into the use of plants and plant microorganisms in the synthesis of bio-compatible, water soluble, fluorescent and protein capped metal, metal sulfide, quantum dots and metal oxide, biominerals, carbon nanoparticles of different sizes and shapes. In a significant departure from bacteria-based methods for nanomaterial synthesis that have been investigated in some detail, we have shown that plant microorganisms such as fungi and actinomycetes when challenged with aqueous metal ions are capable of reducing the ions both intra and extra-cellularly resulting in the formation of stable metal nanoparticles. The formation of metal nanoparticles occurs by an enzymatic process and thus, the fungus-based synthesis process is not limited to reduction reactions alone. The versatility of this approach is underlined by our findings that enzymes such as sulphite reductase, nitrate reductase and hydrolyzing proteins are secreted by the fungi in response to metal stress thereby leading to the possibility of economical room-temperature synthesis of quantum dots, metal nanoparticles and nanooxides.

In the course of evolution, fungi have enjoyed an intimate symbiotic relationship with plants and hence, it is quite likely that plant extracts may also possess useful biomolecules which not only carry out the

above listed range of biotransformations but also control the shape of nanoparticles. In this regard, we have studied a number of plant extracts for realizing metal nanoparticles and have observed that Geranium and Lemongrass extracts result in shape modulated gold nanoparticles. In particular, the reaction of aqueous gold ions with Lemongrass extract resulted in the large-scale synthesis of gold nanotriangles with interesting near infrared absorption. Potential application of the gold nanotriangles, magnetite and other inorganic nanoparticles in diagnosis, imaging, therapeutic and hyperthermia of cancer cells are being investigated.

Biography of the Presenting Author: Prof. Absar Ahmed sir is presently Director, Interdisciplinary Nanotechnology Centre, Aligarh Muslim University, Aligarh, Uttar Pradesh, India. Professor Ahmad has pioneering and key contribution in the field of bio-nano-science and technology. He has 110 very high impact peer reviewed publications like Nature materials, Advanced Materials, Nano letters etc., having citations above 23,905.

Invited Speakers

EMNSD 2020/IS/01

Sustainable Polymer Processing Inspired by Silk

Chris Holland[1]

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Abstract

Silks are biological polymers that have evolved to be processed by controlled protein denaturation, a process depending on the researchers' background, with similarities to amyloidogenesis for some and flow induced crystallisation for others. Understanding the fundamental impact processing has on the performance of a silk fibre will be the focus of this presentation.

Processing silk feedstocks in the unspun, liquid, state has been largely explored over the past 15 years through the use of rheology. In this talk our contributions to this area will be presented and the tools that have been developed to probe structural hierarchies in silk as it self-assembles into a solid fibre.

Discussing more recent work we will draw on how whole animal and feedstock behaviour have supported new perspectives onto silk hydration, the natural spinning process, improved resolubilisation strategies and silk protein applications. We will conclude there is more to silk than just a fibre and that Nature may in fact hold unique solutions to the current challenges facing the synthetic polymer industry, i.e. routes towards low embodied energy, sustainable wet processing of polymers.

Keywords: Silk, Protein, Sustainable, Biomimicry, Bioinspiration

References: www.naturalmaterialsgroup.com

Biography of the Presenting Author: Dr Chris Holland is a Senior Lecturer in the Department of Materials Science and Engineering at the University of Sheffield. Prior to this he studied Biology and obtained his doctorate from Oxford University. The group's research uses tools developed for the physical sciences to better understand how processing effects performance in natural materials, with a focus on relating protein hydration to function. Outside the lab, he is an Associate Editor for ACS Biomaterials Science and Engineering and Chair of the IoM3 Natural Materials Association.

EMNSD 2020/IS/02

Structure Function Relation of Microwave Synthesized Muga Silk Nanoparticles

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Abstract

The structure function relation of Muga silk nanoparticles was investigated. The 3D structure analysis for Muga silk protein was predicted through homology modelling and Ramachandran plot. Silk nanoparticles were synthesized using microwave-assisted radiolysis method from Muga silk fibroin which were characterized by FTIR, CD, XRD, and TEM. The conformational changes of silk fibroin protein to nanoparticle followed an ordered transition from random coil to β-sheets undergoing intermediate transitions into α-helix and β-turn before getting stabilized to metastable β-sheets structure. To find its applicability in next-generation wearable and implantable optoelectronic devices, photoresponsive property of the muga silk protein on flexible substrate were analysed. Nanoparticle based device was found to be active under visible light illumination showing photoresponsivity of 0.119 μA/W. The drug binding efficiency of the muga silk nanoparticle for three drugs of doxorubicin, remdesivir and dexamethasone was studied. The silk nanoparticles showed highest binding affinity of -8.7 kcal/mol towards doxorubicin followed by-7.2 kcal/mol and -7.9 kcal/mol towards remdesivir and dexamethasone respectively. Such high binding affinity would help for slow drug release kinetics and whereas the other two drugs can be loaded when the requirement is for sustained drug release.

Keywords: Muga silk nanoparticles, microwave, opto electronic device, drug delivery

Biography of the Presenting Author: Dr. Indrani Banerjee is presently working as an Associate Professor and Dean, School of Nano Sciences, Central University of Gujarat, Gandhinagar, Gujarat, India. Dr..Banerjee completed her Ph.D. from Bhaba Atomic Research Center, Mumbai and University of Pune.

EMNSD 2020/IS/03

Information and Communications Technology (ICT) and Economy

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Abstract

The advances in information and communications technology (ICT) over past few decades have driven structural changes in economies around the world. In general, the rapid growth of information-intensive services (IISs) has been a hallmark of these changes. A number of ICT-enabled innovative processes (e.g., automation, off-shoring, outsourcing, servitization, process restructuring, operation shifting, self-service) - collectively referred to as service industrialization - are intricately related to this development. There is already clear evidence of broad structural changes in advanced economies. Similar trends have appeared in developing countries, in particular emerging market economies, as well. These developments have significant implications for jobs, wages, and income distribution.

Keywords: Information and communications technology (ICT); information-intensive services (IISs); service industrialization

References:

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Biography of the Presenting Author: Hiranya K. Nath is a Professor of Economics at Sam Houston State University, Huntsville, Texas (USA). With a Ph.D from Southern Methodist University, Dallas (USA) in Economics, Dr. Nath completed bachelor's and master's degree from University of Delhi and M. Phil. degree in Economics from Jawaharlal Nehru University, New Delhi.

EMNSD 2020/IS/04

Fabrication of Flexible Transparent Wood Infiltrating Natural Polymer

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Abstract

Currently, modified wood (MW) has emerged as an eco-friendly substrate for optoelectronics, energy storage, and biomedical devices. The delignified wood can be infiltrated with a refractive index-matched polymer to fill in the lumen pores, and the resultant material is transparent wood (TW) after drying. We plan to impregnate the delignified wood with a bio-compatible and bio-degradable polymer, poly-albumen (PA), to create TW. We hypothesize that PA will create durable TW and be further modified to fire-retardant and electrically conducting wood. The three objectives are: i) creating biocompatible TW by infiltrating delignified wood with PA, ii) modify TW with a metal-organic framework (MOF) to furnish fire-retardancy, iii) and create a TW with electrical conductivity by incorporating silver nanowires (AgNWs). Such MW would have tremendous potential in optoelectronics, energy storage, and biosensors. We characterize samples with FTIR, Raman, UV-vis DRS, XRD, TGA, and SEM.

Keywords: Natural wood, Transparent wood, Flexible, Eco-Friendly, MOF, AgNWs.

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Biography of the Presenting Author: Dr. Bharat Baruah is currently working as an Associate Professor of Chemistry in Kennesaw State University, GA, USA.Prior to this , he was a part time instructor and post doctoral reserarcher at Colorado State University. He did his B.Sc. and M.S. from Dibrugarh University, Assam, India. He completd his Ph.D. from Jadavpur University (IACS), WB, India.

EMNSD 2020/IS/05

Electrochemical Investigation of Nano-porous Gold Electrodes in presence of Biofouling Solutions

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Abstract

Biological processes which are happening in any organism, especially in human beings are based on the electrochemical redox reactions which are in direct correlation with the redox reactions occuring in blood and tissue of the body. It has been identified that the health depends on the redox potential of the body. Hence, it is expected that a healthy and an injured body, may have different redox potentials. If the redox potential can be measured at the wounded area of the body to understand the severity of the illness/injury, it will help the doctors/health care providers to decide the appropriate emergency treatment. Hence this work aims to design and develop a nanostructured electrode which will sense as many biological redox species as possible which in turn can measure the redox potential of blood. Another important point to focus on the electrode surface is to minimize the biofouling. The nanoporous electrodes was prepared and characterized using microscopic methods (SEM, XPS), and electroanalytical techniques including cyclic voltammetry (CV) and potentiometric measurements of redox potential. In presence of biological solutions, how these electrodes resist passivation and the extent of it was evaluated.

Keywords: Bio-fouling, Nanoporous gold, nanoporous electrodes, Open circuit potential

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Biography of the Presenting Author: Dr. Logudurai Radhakrishnan received D. Sc from Tohoku University, Japan in 2008. Further, Dr. Logudurai worked in University of Oklahoma & Virginia Commonwealth University, USA and National Institute for Materials Science, Japan. Presently, He is working as Associate Professor and heading the Department of Chemistry in Madanapalle Institute of Technology & Science, Andhra Pradesh. His research interest in the synthesis and characterization of porous inorganic nanomaterials

EMNSD 2020/IS/06

Recovery of Waste into Value-Added Compounds

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Abstract

The demands are increasing for production of food, fuel and chemicals with increasing the population. Consequently produces huge amount of waste and pollution from the respective sectors per day globally that effect the environment. To maintain the healthy environment in the socioety, we are interested to explore non-toxic, hazardous easily available biomass and those could be converted into its applicable. Lignocellulosic biomass is one of the major source for recovery of value-added compounds. Agro-waste biomasses are found to be highly basic in nature and have been used as renewable heterogenous base catalyst for organic transformation. The water extract of agro-waste ash provide the green solvent and replaces the organic solvent. The detail work will be discussed during presentation.

Keywords: Biomass, agro-waste, heterogeneous catalyst, value-added chemicals.

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Biography of the Presenting Author: With a PhD from National Chemical Laboratiry, Dr. Kalita had worked in TERI, New Delhi,Georgia Tech, Iowa State University; USA and NIMS, Japan. Presently, Dr. Kalita is working as an Associate Professor in the Department of Chemistry, CIT Kokrajhar.

Oral Presentations

EMNSD 2020/OP/01

Challenge and Success in Synthesis Of Quadruple Perovskites At Ambient Condition

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Abstract

The synthesis of quadruple perovskite A'$A_3B_4O_{12}$ generally requires high temperature and pressure to fix the JT active A-site cations in square planar coordination, which hinders exploration of this family of oxides. The high pressure synthesized members of these family exhibit exotic magnetic and electrical properties. However, early synthesis of $CaCu_3Ti_4O_{12}$ opens up the possibility to obtain other members through chemical modification at ambient pressure. Starting with antiferromagnetic (Ca/Bi/Ln)$Cu_3Ti_4O_{12}$ we obtained several compositions at ambient pressure through chemical substitution on A- and B-sites [1]. The substitution of nonmagnetic Ti^{4+} by magnetic ions results in dramatic evolution in magnetic and electrical properties. In this presentation I will highlight the contrasting magnetic features of sol-gel synthesized Cr, Mn and Fe-substituted (Ca/Bi/Ln)$Cu_3Ti_4O_{12}$. The antiferromagnetic spin alignment of A-site Cu^{2+} ($Cu^{2+}\uparrow$—O—Ti—O—$Cu^{2+}\downarrow$) in (Ca/Bi/Ln)$Cu_3Ti_4O_{12}$ abruptly change to parallel configuration eventually giving ferrimagnetic state by antiferromagnetic coupling with Mn B-sublattice i.e. ($Cu^{2+}\uparrow$—O—Mn$\downarrow$—O—$Cu^{2+}\uparrow$). This effect is less pronounced for Cr and Fe doped samples, where spin rearrangement is rather localized around the dopant. The Fe-doped samples exhibits phase separation and enhanced magnetic moment with Fe loading. The Cr-doped samples barely affect the original transition ~25 K. However, a new transition appears in $BiCu_3Ti_3CrO_{12}$ at 85 K. The role of stereoactive $6s^2$ lone pair of Bi^{3+} will also be highlighted.

Keywords: Ambient pressure, Antiferromagnetic/Ferromagnetic spin alignment, Magnetic transition.

References: A.Haque, A. K. Shukla, U. Dutta, D. Ghosh, A.Gayen, P.Mahata, M. Vasundhara, A.K Kundu, M.M. Seikh, Ceramics International **46,** 2020, 5907-5912.

Biography of the Presenting Author : Ariful Haque passed B.Sc. from Maulana Azad College in 2014 and M.Sc. from Visva- Bharati University in 2016. He is currently working on higher ordered perovskite materials under the guidance of Dr. Md. Motin Seikh, Visva-Bharati University.

EMNSD 2020/OP/02

Chromeno[2,3-*b*] indoles as ultra-high Stokes shift luminescent materials

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Abstract

Synthesis and photophysical studies on three polycyclic chromeno[2,3-*b*] indoles are reported here. The three chromeno[2,3-*b*]indoles were synthesized by metal-free C-H functionalization. The three chromeno[2,3-*b*] indoles do not exhibit any solvent effect in absorption spectra but they exhibit significant solvent effect in fluorescence spectra, suggesting that excited states of these molecules involve strong solute-solvent interaction. All the three molecules exhibit ultra-high Stokes shift of the order of 24696 cm^{-1} (3.07 eV) in acetonitrile and 17054 cm^{-1} (2.12 eV) in ethyl acetate. To understand the origin of the ultra-high Stokes shift in these molecules, computational investigation into absorption and fluorescence in gas and solvent phases were performed. It was observed that analysis of the frontier molecular orbitals as well as natural transition orbitals depict excited state intramolecular charge transfer in these molecules. Further, gas phase and solvent phase optimized structures in ground state and excited states of these molecules exhibit increase in planarity of the molecules in the excited states. Thus, excited state intramolecular charge transfer accompanied by structural relaxation leading to increase in planarity in the excited state was suggested to cause ultra-high Stokes shift in these molecules.

Keywords: chromeno[2,3-*b*] indole, ultra-high Stokes shift, charge transfer, planarity

References:

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Biography of the Presenting Author: M.Sc. in 2004 from Gauhati University; Ph.D from IIT Kanpur (2012); Served as Assistant Professor at Nowgong College, Biswanath College and then subsequently joined Cotton Universty in 2015. Research interest includes fluorescent sensors and organic photovoltaics.

EMNSD 2020/OP/03

Waste *Sesamum indicum* Plant: An Efficient Heterogeneous Catalyst for Biodiesel Production

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Abstract

In this study, waste *Sesamum indicum* plant derived material is utilized as an efficient heterogeneous catalyst for biodiesel production from sunflower oil. The catalyst was characterized by using Powder XRD, BET, FT-IR, TGA, AAS, SEM, EDX, XPS and TEM. Characterization showed the well-ordered porous materials with high percentage of K (29.64 wt. %) and Ca (33.80 wt. %) as oxides and carbonates. The catalyst exhibited excellent catalytic activity yielding 98.9% biodiesel under the optimized conditions of 12:1 methanol to oil ratio and catalyst loading of 7 wt. % at 65 ^{o}C in a short reaction time of 40 min. The material is reusable up to the 3rd cycle of reaction with no significant decrease in the catalytic activity. The produced biodiesel was characterized by using FT-IR, NMR, and GC-MS techniques. Properties of the biodiesel meet the prescribed limits of international standard.

Keywords: Sesamum indicum, heterogeneous catalyst, transesterification, biodiesel.

Biography of the Presenting Author: Sanjay Basumatary did M.Sc. in Chemistry from Gauhati University in 2007. He received his Ph.D. in Chemistry from Gauhati University in 2012 under the supervision of Prof. Dibakar Chandra Deka. Dr. Basumatary is currently working as an Assistant Professor in the Department of Chemistry, Bodoland University, India. His research interests include renewable energy, biodiesel, catalysis and natural products. He has published several research papers in national and international journals and also presented papers in national and international conferences.

EMNSD 2020/OP/04

All-optical Binary to Quaternary Radix Converter using SOA-PRS

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Abstract

In this communication, we have designed an all-optical "Binary to Quaternary" radix converter (Fig.1) using Semiconductor optical amplifier based polarization rotation switches (SOA-PRS). The design is simple, less power consuming (optical <1mW, bias current <200mA) with high operational speed (~100 Gb/s). The circuit is quaternary polarization encoded (where 0, 1, 2 & 3 represents no light, horizontally polarized light, vertically polarized light, and mixed polarized light respectively). In presence of the pump signal (A, B), non-linear polarization rotation in SOA-PRS 1 and 2 happens. In that case, the polarity of the input probe signal (1, 2) will be changed at the output Y1 and Y2 as per the table1. Now, A and B inputs are representing the Most Significant Bit (MSB) and Least Significant Bit (LSB) of a binary number (radix base=2) respectively. The output Y represents the quaternary number (radix base=4) equivalent to the input binary numbers.

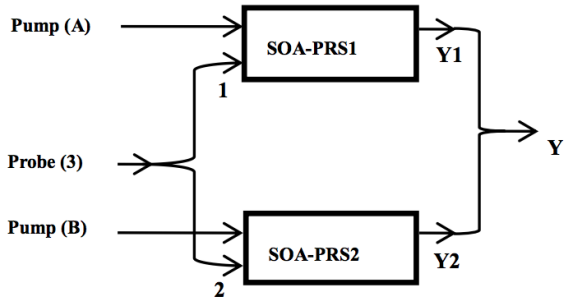

Fig.1. Design of the Radix Converter

Table1: The truth table of the Radix Converter

Binary Input				Quaternary Output
A (MSB)	B (LSB)	Y1	Y2	Y=Y1+Y2
0	0	0	0	0
0	1	0	1	1
1	0	2	0	2
1	1	2	1	3

Keywords: Semiconductor optical amplifier, Non-linear polarization rotation, radix converter

References: [1] A.Raja, K.Mukherjee, J.N.Roy, K.Maji, Journal of Optics (Springer), 2020, DOI:10.1007/s12596-020-00594-7

Biography of Presenting Author: Ashif Raja did his B.Sc. and M.Sc. in Physics from The University of Burdwan. Recently he is working as a Research Scholar at Kazi Nazrul University. His area of interest is Photonics.

EMNSD 2020/OP/05

A study on Iron Oxide (γ- Fe_2O_3) Nanoparticles synthesised using precipitation method and its possible applications

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Abstract

The use of nanotechnology has recently shown great impact on society and environment. Nanomaterials that showing magnetic behaviour and because of its great potential applications have become very popular. Iron oxide nanomaterials have received considerable attention because they show unique properties like extremely small size, high surface to volume ratio, surface modification property, excellent magnetic properties and shown to be better biocompatible. Therefore more efforts have been devoted for the synthesis of ecofriendly and biocompatible Iron Oxide NPs. Magnetite (Fe_3O_4) and Maghemite (γ- Fe_2O_3) and Hematite (α-Fe_2O_3) are very important and promising member of Iron oxide family and are becoming popular among the researcher because of its unique promising properties like biochemical and magnetic behaviour, catalytic action etc which can be proved to be suitable to provide specific technical and biomedical applications.

Keywords: Nanomagnetism; superparamagnetic; Nanoparticle.

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Biography of Presenting Author : Bandana Gogoi is currently working as an Assistant Professor, Department of Physics, D. N. Govt. College, Itanagar, Arunachal Pradesh

EMNSD 2020/OP/06

Plasmon Resonances in Interacting Ni Nanoparticles Embedded in Dielectric

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Abstract

The optical absorption (OA) properties of interacting Ni nanoparticles (NPs) of radius 10 nm embedded in dielectric have been studied theoretically, using modified Maxwell-Garnett (MG) model. The OA spectra for non-interacting NPs exhibit two broad absorption bands corresponding to 3.69 eV and 6.06 eV in lower and higher energy region. These absorption bands come from surface plasmon resonances (SPR) in Ni NPs. Here, we have considered interacting Ni NPs and the interaction is represented by a parameter *K*. For our calculation we have varied the value of *K* from 0 to 50. Interestingly, the plasmon resonance peak shift towards lower energy side with increase of *K*. Moreover, the amount of shift in this case is much larger than the shift due to change of particle size. This can be explained on the basis of driven damped harmonic oscillator model. It is well known that Ni is a strong ferromagnetic material. Therefore, the simultaneous existence of ferromagnetic and plasmonic properties make the Ni NPs more superior and can be used as optical nanoantennas for magnetic manipulation and also in different optoelectronic and photonic devices

Keywords: Ni nanoparticles, surface plasmon resonance, interparticle interaction, peak shift

References: 1. P. K. Kuiri, J.K. Majhi, Plasmonics, 1 (2017) 11

Biography of the Presenting Author: Mr. Jayanta Kumar Majhi is an assistant professor in Physics of Banwarilal Bhalotia College, Asansol, India. He has obtained his M. Sc. degree from the University of Burdwan, West Bengal, India. His area of research interest is Optical Properties of Nanomaterials. So far He has published six papers in different peer reviewed international journals and six papers in conference proceedings of national and international repute.

EMNSD 2020/OP/07

Biocompatible Nanocarrier For Effective Delivery Of Antimicrobial To Agricultural Crop

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Abstract

Globally agricultural crop plays an important role in various sectors ranging from food, feed to fibres. Although various genetically modified products in agriculture farming have made breakthroughs in crops productivity, there are yet many gaps in terms of other pest control measures thus ultimately affecting crops yield. India is one of the leading countries in agricultural economy. After the green revolution wide use of chemicals have given a larger push to the agriculture production and productivity worldwide. At the same time larger use of various chemical agents such as fungicides, herbicides, pesticides leads to environmental damage and humans also suffer economically. Nanotechnology seems promising to overcome this problem. Various organic and inorganic metal and metal oxide based nanoparticles are implemented in agriculture field for number of plant disease control to stimulation of plant growth. While bioaccumulation of such non-biodegradable nanoparticles is a major challenge and thus affecting eco system and ecology. Thus present approach is the development of eco-friendly biocompatible and biodegradable nanocarrier for effective delivery of antimicrobial agent to plant infecting pathogen seems sustainable and environmental friendly.

Key words: Plant disease, Antimicrobial agent, biocompatible Nanocarrier

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Samer H. H., Aminu K., Mohd Z. F., Sharida F.,(2016). Preparation of chitosan nanoparticles as a drug delivery system for perindopril erbumine. *Polymer composite*. DOI 10.1002/pc.23967(2016).

Biography of the Presenting Author: Ms. Gunjan H. Vyas is M.Sc. in Medical Biotechnology from Sardar Patel University, Gujarat. She completed M.Phil. in Nanosciences from Central University of Gujarat. Presently, she is a Ph.D. scholar under the guidance of Dr. Umesh Kumar at Central University of Gujarat, Gandhinagar, Gujarat

EMNSD 2020/OP/08

Preparation of carotenoid Loaded BSA Nanoparticle Stabilized by Biosurfactant

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Abstract

Flavonoids are diverse group of phytonutrients found in most of the fruits and vegetable. Along with carotenoid they are responsible for different colours in fruits or vegetables. These carotenoids have many beneficial biological activities including anti-cancer, anti-diabetics and antioxidant activity. However, due to low aqueous solubility their clinical efficacy is limited, leading to poor oral bioavailability. Therefore, to meet these challenges, the scientific community has turned a lot of attention and interests towards nanocarriers based delivery of carotenoid for enhancing bioavailability and efficacy. Protein-based nanoparticle posses such characteristics such as they are biodegradable, biocompatible and non-toxic. Albumin NPs has proven to show a splendid future for controlled delivery of nutraceuticals. The purpose of this work is to fabricate biosurfactant stabilized BSA nanoparticle to deliver the molecule of nutraceutical importance. We proposed to develop a novel nanocarrier for delivering nutraceuticals with improved bioavailability. Such kind of nanocarriers could also find its possible applications in delivering other molecules of nutraceuticals importance.

Keywords: Drug delivery, nanoparticles, nutraceuticals, bioavailability.

Biography of the Presenting Author: Jyoti Jaiswal is a research scholar, pursuing M.Phil-PhD at School of Nano Sciences, Central University of Gujarat under the guidance of Dr. Umesh Kumar. Her current area of research interest is drug delivery.

EMNSD 2020/OP/09

Microstructure and Abnormal Coalescence Behavior of Ion Beam Sputter Deposited Silver and Gold Thin Films

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Abstract

The coalescence behaviour of low energy ion beam sputter deposited discontinuous silver and gold thin films on to carbon coated copper grids and borosilicate glass substrate is reported. Discontinuous Ag and Au films were deposited at Ar ion energies of 150 and 450 eV respectively for durations of 5-15 min and substrate temperatures from ambient to 300°C. Abnormal coalescence on carbon coated Cu substrates is observed using transmission electron microscopy (TEM) and normal coalescence on glass substrate by using atomic force microscope (AFM). It manifests as decrease in the island sizes both as a function of increasing thickness of the films as well as increasing substrate temperature. Electron diffraction and lattice images show that the films are crystalline at all temperature and thicknesses. The abnormal nature of the coalescence is established by depositing the films under the same conditions on borosilicate glass substrates. In contrast to the films on carbon coated Cu substrates, films on the glass substrates exhibit the normal grain coarsening behavior as a function of increasing thickness and temperature. The abnormal coalescence behaviour is attributed to the high surface roughness of the carbon coated Cu substrates. It is proposed that substrate roughness controlled nanostructuring can be an easy method to achieve a variety of nanostructured thin films.

Keywords: Microstructure, abnormal, Silver, Gold, TEM, AFM, thin films.

Biography of the Presenting Author: Dr. Rajeeb Brahma is currently working as an Assistant Professor in the Department of Physics, Bodoland University, Kokrajhar, Assam

EMNSD 2020/OP/10

Synthesis and Ultrasound-assisted Extraction of Polyhydroxybutyrate (PHB) from Invasive Weeds

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Abstract

The usage of plastics such as polypropylene and polyethylene have increased alarmingly for different applications because of their strength, durability, resistant to chemicals and ease of molding. However, the petroleum derived polymers contribute a long term problem in solid waste management. In order to resolve the disposal problem Polyhydroxyalkanoates (PHAs) polymers have been recognized as the best alternative to the conventional plastics, as they possess material properties similar to conventional plastics. In the current research work, invasive weeds like *Parthenium hysterophorous* and *Water hyacinth* were taken for the production of PHB. High frequency sonication was applied to achieve efficient PHB extraction, which replaces the simultaneous usage of both homogenizer and rotary evaporator. Spectroscopic techniques like Nuclear Magnetic Resonance (NMR) and Fourier Transform Infrared Spectroscopy (FTIR) confirm all the functional groups present in the PHB. The X-Ray powder Diffraction (XRD) shows the partial crystalline characteristics of PHB. The Differential Scanning Calorimetry (DSC) curve determined the melting point and glass transition temperature of synthesized PHB, which are similar to standard PHB. The Thermogravimetric Analysis (TGA) and the Differential Thermogravimetry (DTG) analysis depict better thermal stability of synthesized PHB compared to standard PHB.

Keywords: Biopolymer; Polyhydroxybutyrate; Microorganism; Fermentation; Sonication.

Biography of the Presenting Author: Sushobhan Pradhan is a Ph.D. candidate in the School of Chemical Engineering at Oklahoma State University (OSU), Stillwater since 2016. He completed his bachelor's degree from Indira Gandhi Institute of Technology, Odisha, India in Chemical Engineering in 2014, and master's degree from Indian Institute of Technology Guwahati in Chemical Engineering with 'Petroleum Science and Technology' specialization in 2016. His current research interest includes surface chemistry, bubble nucleation, enhanced oil recovery and polymer technology. He has published eight journal articles, four conference papers, and three invited book-chapters. He was awarded with Distinguished Graduate Fellowship for two consecutive years for his academic achievements, professional contributions, and leadership roles at Oklahoma State University during his doctoral studies. He was the recipient of 'National Award for Technology Innovation' by the Government of India, for 'Innovation in polymeric materials' in 2017.

EMNSD 2020/OP/11

Biodiesel production from waste cooking oil using a novel heterogeneous catalyst based on calcium oxide nanoparticles

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Abstract

Waste cooking oil (WCO) is a promising low-cost source for biodiesel production which is being widely used as a renewable and alternative source of energy[1]. In this study, novel nanocatalyst CaO nanoparticles were synthesized via co-precipitation method. The proposed nanocatalyst showed a promising ability as a heterogeneous catalyst for the transesterification of WCO to produce fatty acid methyl esters (FAMEs) as biodiesel[2]–[4]. The XRD, UV-VIS and FTIR, were used for the characterization of nanocatalyst to evaluate crystallite size and crystal structure respectively. The effective parameters on the transesterification of WCO to FAMEs yield includs oil to alcohol ratio, reaction time, and reaction temperature were studied. Other parameters like density, kinematics viscosity, high heating value, cetane number, flash point, cloud pint and pour point have been studied and compared them with diesel fuel. Testing the engine performance and the emissions of synthesized biodiesel and its comparison with diesel emission were performed according to ASTM standards[5]. Based on the results, it may be proposed that CaO nanocatalyst can be used as an alternative potential heterogeneous catalyst to produce biodiesel from WCO.

Key Words: Biodiesel, FAMEs, nanosynthesis, catalyst, Waste cooking oil, XRD,

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Biography of the Presenting Author: Mr. Gaurav Singh holds M.Sc. (Chemistry) and M.Tech. (Nanotechnology) degrees. Currently he is pursuing Ph.D. (Chemistry) from CIT Kokrajhar, Assam. He is currently working as an Assistant Professor in St. Peter's Engineering College, Maisammaguda, Hyderabad (Telangana). He has over 10 years of teaching and research experience.

EMNSD 2020/OP/12

Study on Electrical Characteristics of Normally On Junctionless Field Effect Transistor

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Abstract

This paper presents the concept of normally on Junctionless field effect transistor. For a normally on junctionless field effect transistor the work function of the gate material is much lower compared to the channel material. A negative gate voltage can be applied to turn the device off. A simulation study on the device electrical performance has been done in TCAD (Technology Computer Aided Design). The study shows that the normally on device exhibits higher Ion/Ioff ratio and better subthreshold slope compared to a normally off device.

Keywords: Field effect; Junctionless; Normally on; Normally off; Work function

References:

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EMNSD 2020/OP/13

Depletion Width Determination of Double gate Junctionless Field Effect Transistor With Triangle Shaped Spacer

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Abstract

The process of determination of depletion width of Double gate Junctionless field effect transistor (JLFET) with triangle shaped spacer. The structure consists of a spacer of the shape of a triangle extended upto the source-drain ohmic contacts. One dimensional Poisson's equation has been solved at various boundary conditions considering the geometry of the structure to obtain the mathematical model. Dependence of depletion width on gate oxide thickness, gate dielectric material, gate to source voltage and channel position along x-direction is shown.

Keywords: Double gate; Depletion width; JLFET; Triangle shape; Spacer

References:

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EMNSD 2020/OP/14

Tera-Hertz Optical Asymmetric Demultiplexer(TOAD) using quantum dot Semiconductor Optical Amplifier

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Abstract

TOAD is an important all optical switch having various applications in all optical logic gates and processors. It finds applications in designing different types of processors for optical networking also like code converters, parity checker, generator etc. Most of the TOAD based designed so far reported used Semiconductor Optical Amplifier(SOA) for designing the TOAD, but in this communication conventional SOA is replaced by quantum dot SOA or QDSOA. This enables the device to operate with high speed as demanded by the modern day optoelectronic communication systems. QDSOA has higher operating speed due to its lower gain recovery time compared to conventional SOA. In this paper TOAD based on QDSOA is investigated.

EMNSD 2020/OP/15

Effect of Annealing Temperature on the Structural and Optical Properties of ZnO Nanoparticles Synthesised by Colloidal Route

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Abstract

Zinc oxide (ZnO), is a functional material having wide band gap energy (~3.37 eV) and large exciton binding energy (~60 meV). It exists in different shape and sizes for potential application in various devices like photovoltaic (PV), photo diodes and other opto-electronics. As PV application, ZnO nanoparticles (NPs) are widely used as active layer, electron selective layer, antireflection coating etc. Here, ZnO NPs have been synthesized using precursor zinc acetate di-hydrate and lithium hydroxide monohydrate by a simple chemical colloidal route. The synthesized samples are annealed at different temperature in the range of 300-600°C for 1 hr in air. Its structural, optical and photoluminescence (PL) properties with respect to annealing temperature have been investigated by using different characterization tools like, X-ray diffractometer (XRD), scanning electron microscope (SEM), EDS, FTIR spectroscopy, Raman spectroscopy and photoluminescence (PL) mesurments. The crystalline structure of ZnO NPs is found to be improved with single phase wurtzite structure after annealing at 600°C as shown in fig 1(a). ZnO NPs are found to have spherical shape as shown in fig.1(b) with varying sizes (50-100 nm) and their band gap energy ranging between (3.52-3.02 eV). Defect levels present in the sample is investigated by PL spectra and shown in fig.1(c). Hence, the properties of ZnO NPs prepared by simple colloidal route can be enhanced for its potential solar cells applications.

Keywords: ZnO nanoparticles, colloidal, annealing, properties

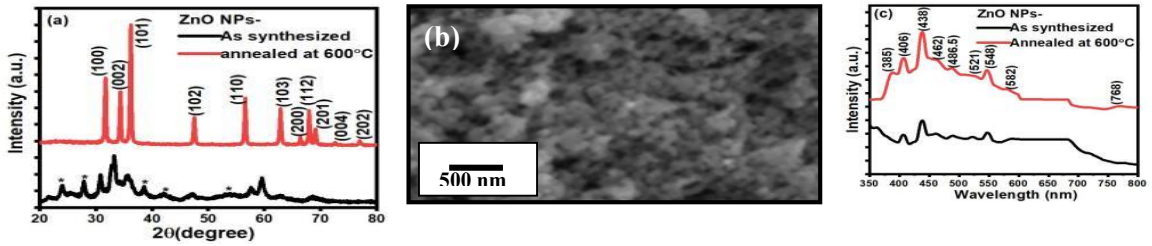

Fig 1. (a) XRD patterns (b) SEM image of ZnO NPs annealed at 600°C and (c) PL spectra of ZnO NPs

Biography of Presenting Author: Premshila Kumari is currently NREF-JRF (MNRE, Govt. of India) at CSIR-National Physical Laboratory, New Delhi, & pursuing Ph.D in AcSIR. Her research aim is to study ZnO nanostructures based solar PV devices and understand the device physics

EMNSD 2020/OP/16

Investigation of the Spin Speed Variation on the Performance of PEDOT:PSS/Si Hybrid Solar Cells

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Abstract

bOrganic/Si heterojunctions are one of the prominent technology which gives the benefits of low cost solution process based device fabrication. Theoretically these devices have potential to achieve high power conversion efficiency (PCE) equivalent to conventional Si solar cell. Poly(3,4-ethylenedioxythiophene) poly(styrene sulfonate) (PEDOT:PSS) has attracted a lot of interests due to its high conductivity and optical transparency in the desired solar spectrum for organic/Si hybrid solar cells. The performance of the PEDOT:PSS/Si solar cells' is crtically contingenet on the PEDOT:PSS layer and PEDOT:PSS/Si interface which largely rely on the coating parameters. In this study, influence of spin speed variation on the performance of the PEDOT:PSS/Si solar cells is investigated. Ethylene glycol (EG) doped PEDOT:PSS layer is coated onto the optimized micro-textured (μT) (via KOH process) Si wafers under 600 rpm to 1200 rpm for 240 sec. Pre and post heat treatment was done in order to get hydrophilic thin SiO_x layer and moisture free stable device. It is found that spin speed affects the conformality of the polymer layer on the μT-Si surfaces and hence the PCE of solar cell. The best performances were obtained for 800 rpm spin speed resulting PCE of ~12.20% with a simple devie structure of Ag/PEDOT:PSS/Si/In-Ga. The PEDOT:PSS/Si solar cell techonology open the path of low cost solution proess based future technology.

Keywords: PEDOT:PSS, Silicon, Solar cell, Spin speed.

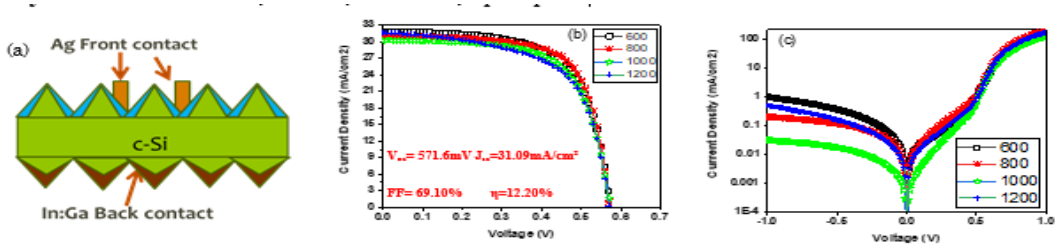

Fig: (a) A schematic of device structure of PEDOT:PSS/μT-Si solar cell (b) Illuminated J-V charcteristics (insert best cell parameters (V_{oc}, J_{sc}, FF, eff.) and (c) Dark J-V characteristics.

Biography of the Presenting Author: Avritii Srivastava is currently DST-Inspire senior research fellow at CSIR-NPL, New Delhi pursuing Ph.D in AcSIR. Her research aim is to develop cost-effective solar PV devices.

EMNSD 2020/OP/17

Hydrogen Adsorption on $TMMg_3$(TM=Ni, Pd, Pt) Clusters: First Principles Study

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Abstract

The limited availabibilty of the fossil fuels and their combustion producing noxious by-products are some serious threats to deal with in the field of energy. However, being safe, clean and reneuable energy carrier, hydrogen has a great possibility to be used as a suitable alternative for the fossil fuels in both future mobile and stationary power stations. In this work, we have studied the adsorption of hydrogen on transition metal (TM) atom doped magnesium (Mg) tetramers ($TMMg_3$ clusters) using Density Functional Theory (DFT) method with dispersion corrected ωB97X-D functional. Symmetry unrestricted full geometry optimizations have been carried out for various possible structural isomers of bare $TMMg_3$ and H_2 adsorbed $TMMg_3$ (H_2TMMg_3) clusters to find out their lowest energy structures. The resulting lowest energy $TMMg_3$ clusters are found to possess distorted tetrahedron geometries (Figure 1). The increment in size of the dopant TM atom pushes the Mg atoms away from each other in the $TMMg_3$ clusters leading to the increment in their Mg-Mg distances. For all the clusters, H_2 gets molecularly absorbed on top of the TM atoms (Figure 1). The highest binding energy of H_2 (-0.76 eV) is observed for $NiMg_3$ cluster. Analyses of charge transfer and density of states reveal that interaction of bonding and antibonding orbitals of H_2 with the TM orbitals is a key factor in H_2 adsorption.

$NiMg_3$ $PdMg_3$ $PtMg_3$ H_2TMMg_3

Figure 1: Lowest energy structures of $TMMg_3$ clusters and H_2TMMg_3 Complex.

Keywords: Cluster, Hydrogen Adsorption, Density Functional

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EMNSD 2020/OP/18

Effect of the Ligands PPIA and TOPO on the spectroscopic behaviour of Sm^{3+} ions in sol-gel silica matrix

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Abstract

The photoluminescence (PL) properties of Rare Earth complexes have been enthralling researchers for decades owing to their broad applications in material science, biochemistry, medicine, optical and laser active devices and so forth. The Rare Earths in general are extensively studied as luminescent materials due to their long-lived lifetimes, narrow width emission bands, hypersensitivity to coordination environment etc. Among different routes, Ligand sensitization is a promising one for the enhancement of Rare Earth luminescence.

Sm^{3+} singly doped, Phenylphosphinic acid (PPIA) co doped Sm^{3+} and PPIA, Trioctylphosphin oxide (TOPO) co doped Sm^{3+} silica samples were prepared by sol-gel method. Structural study of the samples were performed by XRD and FTIR analysis. Study of the PL spectra reveals an enhancement in PL intensity by 3.36 times for PPIA co-doped sample; whereas the enhancement is by 5.19 times with the addition of TOPO to the PPIA co-doped samples. The observed absorption and PL spectra of the samples were analysed with the help of Judd-Ofelt theory.

Keywords: Rare Earth, Ligand Sensitization, Photoluminescence, Energy transfer.

References:

[1] P. Manasa, C.K. Jayasankar, Luminescence and phonon side band analysis of Eu3+doped lead fluorosilicate glasses, Opt. Mater. 62 (2016) 139–145

Biography of the Presenting Author: Navaneeta Rajkonwar is a Research Scholar in the Department of Physics, Dibrugarh University. She is working in the area of Rare Earth Spectroscopy. Her primary research interest is the study on the Photoluminescence enhancement from Rare earth ions in Silica matrices with the doping of suitable Ligands.

EMNSD 2020/OP/19

Mg-doped ZnO Nanomaterial: Anefficient sunlight driven photocatalyst

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Abstract

Green energy production and clean environment are the two major concerns of the current paradigm. Semiconductor Photocatalysis is an emerging technology to address both energy and environment issues. Out of many semiconductor materials Zinc Oxide (ZnO) is found to be outstanding photocatalyst with high photocatalytic performance in UV-region. In order to extend the absorbance efficiency of zinc oxide towards the visible region, different concentrations (0-1 wt%) of Mg-doped ZnO were synthesized via simple co-precipitation method. The structural, morphology, elemental and optical behavior of the synthesized nanomaterials were studied. The photocatalytic performance of the samples were tested using methylene blue as probe pollutant. The result indicates that 0.5% Mg-doped ZnO exhibits superior photocatalytic performance attributed to the extended photo absorption towards visible region along with reduced recombination of photogeneratedcharge carrier.

Keywords: Photocatalysis, rate constant, Zinc Oxide.

Biography of the Presenting Author: Riu Riu Wary is a research scholar of Dept. Of Physics in CIT, Kokrajhar. He has completed his master's from NIT, Silchar, Assam, India in 2018. His research interests include photocatalysis, DSSC and Biopolymer. He has published two journal papers and three conference proceedings during his master's degree and currently working on composite based materials for solar energy applications.

EMNSD 2020/OP/20

Direct Synthesis of Co_3O_4 Nanomaterials by Carbonate Precursor

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Abstract

Herein, the monodisperse Co_3O_4 with various morphology is reported. Within this demonstration, a series of Co_3O_4 with different morphology was synthesised using cobalt ammonium carbonate as precursor by hydrothermal method. In the present work we successfully synthesize pure phase of Co_3O_4 microcube (**Figure 1**) by direct (one step) hydrothermal process by carbonate-based precursor. The materials were characterized by XRD, SEM, TEM, EDX, TGA analysis. The kinetics have been studied for the formation mechanism of the materials. The materials were used for the post synthesis of core-shell type materials for different task specific applications. The synthesis of this material requires simple laboratory instruments and is expected to be a useful energy material.

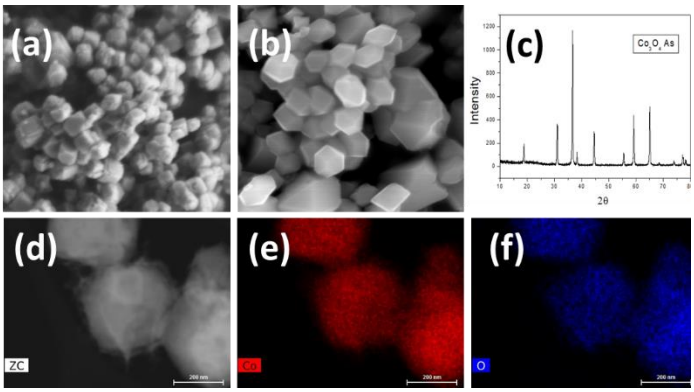

Figure 1: (a) & (b) SEM images of Co_3O_4 Microcube and polyhedron; (c) XRD of Co_3O_4 Microcube (d), (e) & (f) EDX mapping of Co_3O_4 cubes.

Keywords: Co_3O_4, nanostructure, Hydrothermal

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4. Zhang *et al.* CrystEngComm, **2011**, *13*, 2123.

Biography of the Presenting Author: Dr. Arnab Kanti Giri graduated as M.Sc. (Chemistry) in 2010 from Vidyasagar University, West Bengal. He then joined the research group of Dr. Asit Baran Panda at CSIR-Central Salt & Marine Chemical Research Institute (CSIR-CSMCRI), Bhavnagar, India for doctoral studies and received his Ph.D. degree in 2016. After postdoctoral studies from KAUST, KSA & DGIST, South Korea he obtained the position of Assistant Professor at Indus International University, Himachal Pradesh. Later on he shifted to Karim City College, Jamshedpur. He has published 11 research articles in SCI(E) journals and 1 Indian Patent.

EMNSD 2020/OP/21

Orientational Order, Optical and Dielectric Properties of Liquid Crystals containing Bicyclohexane Rigid Core

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Abstract

Mesomorphic properties of several non-polar compounds liquid crystalline materials which have same bicyclohexane core and different terminal groups have been investigated. These nematogenic mesogens show several characteristics like high purities, low birefringence and low electrical conductivity, that are useful in liquid crystal mixtures for display applications [1]. However, they show large viscosity leading to greater response times [2]. The difference in the terminal molecule markedly affects the behavioral change in these compounds. Measurements of optical birefringence have been conducted by two different probing methods *viz*. thin prism and optical transmission (OT) methods and the two sets of values are in good agreement with a small deviation of about 2–3%. Moreover, by analyzing the temperature behavior of the orientational order parameter both from optical birefringence Δn directly (OT data) and also from density and individual refractive indices, it has been found that temperature dependent behavior of the order parameter agree quite well upto 10°C below the nematic-isotropic transition and deviates on the average around 2% far from the clearing temperature. Possible cause may be due to unrealistic manifestation of the optical characteristics of a liquid crystalline media arising for a precise reckoning of the local field surrounding a molecule far from the nematic-isotropic transition.

Keywords: liquid crystals, bicyclohexane compounds, birefringence, Orientational Order parameter

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[2] L. Pohl, R. Eidenschink, J. Krause and G.Weber, Physics Letters A., 65(2), 169 (1978).

Biography of the Presenting Author: Sarmistha Mondal, Assistant Professor, Department of ECE, Siliguri Institute of Technology, Sukna, Siliguri, Darjeeling-734009, West Bengal, India

EMNSD 2020/OP/22

Design of a Power Inverter Using Solar Cell As A Source Of Charger

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Abstract

The increasing demand and depletion of fossil fuels in India lead us to shift our focus to renewable sources which are not only the future unlimited source of energy but also eco friendly and viable for environment. Solar energy is a form of renewable energy and is a very efficient method of saving electricity which does the same functioning as the electricity but the main difference is that the major source is solar energy. This paper focuses on the design of solar modules serve as a source of charger through solar charge controller to the battery and inverter for converting the direct current into an alternating current for house hold application. It has more advantages because it needs less maintenance, no use of fuel, light in weight, rugged, noiseless and does not require an alternating current for charging.

Key Words : *Solar cell, Inverter Circuit, MOSFET*

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Biography of the Presenting Author: Hemen Ch Medhi is currently working as an Assistant Professor,,Department of Electronics, St. Edmund's College, Shillong

EMNSD 2020/OP/23

Comparision of Polyvinyl Alcohol Capped Chemically Synthesized CdS and CdZnS Nanostructured Films

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Abstract

In this paper, synthesis of PVA capped nanostructured CdS and CdZnS films by chemical route and their structural, morphological and photophysical properties are reported. XRD and TEM analysis confirmed the formation of CdS and CdZnS nanoparticles with particle size <15 nm and <10 nm respectively. The particle size of CdS films were found to decrease with increasing molar concentration of $CdCl_2$ and that of CdZnS nanoparticles decreases with increasing Zn concentration. Transmission electron microscopic images show that the particles are nearly spherical and uniformly distributed. Selected-area electron diffraction patterns support the formation of cubic phase of the films in both the samples. Optical absorption peaks of the films shift towards lower wavelength side and CdS samples are blue shifted compared to their bulk counterparts. The optical band gap ofCdS films increase with increasing molar concentration of $CdCl_2$and that of CdZnS increases with increasing zinc concentrationattributable to the quantum confinement effect. The increase in molar concentration enhances the photoluminescence emission intensity of CdSwhile the zincconcentration increasesthat of CdZnS films.

Keywords: CdS film, CdZnS films, Blue shift, Quantum confinement effect

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2. Bijoy Barman, Kanak Chandra Sarma, Solid State Sciences,**109** (2020) 106404

Biography of the Presenting Author: Dr. Prince Kumar Mochahariobtained his PhD degree fromGauhati University.He currently holds a position as Associate professorat Bodoland University, Assam,in the department of Physics. Prior to joining Bodoland University, he was a faculty in Physics in DKD College, Dergaon, Assam. His research focuses on Thin Film Nano.

EMNSD 2020/OP/24

Application of Nanofluids for heat transfer processes

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Abstract

Cooling of chemical, electrical and electronic equipment is a matter of concern for developing green technologies to be used in industries. Removal of heat is effected by thermal conductivity of conventional heat transfer fluids. This can be increased by using nanoparticles in the fluid medium. However, there are concerns encountered while maintaining stability of nanofluids for long time. Present study was carried out to review the current progress on the stability as well as thermal conductivity of various nanofluids. Some nanofluids have been identified with better stability as well as thermal conductivities which may be helpful in future designing of various systems in industries. Preliminary studies were conducted and reported to check the stability of Cu-PAni hybrid nanoparticle in water as base liquid. This paper confirms the improvement in stability of nanofluid for different Cu-PANI nanoparticle concentrations and has been reported.

Keywords: Nanofluid, synthesis, characterization, stability, heat transfer

References: 1. Wei Yu and Huaqing Xie, A Review on Nanofluids: Preparation, Stability Mechanisms, and Applications, Journal of nanomaterials (2012) 1-12.

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EMNSD 2020/OP/25

Application of *Musa paradisiaca* derived ashes as heterogeneous base catalyst for Cross-Aldol reactions at room temperature

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Abstract

In the current work, *Musa paradisiaca* (Malbhog Kola) peel/rhizome ashes were used as a solid heterogeneous base catalyst for Cross-Aldol reactions, between different aldehydes and ketones at room temperatures. The banana peel/rhizome ashes derived catalyst were calcined at 550°C to remove the organic matters and characterized by XRD, FT-IR, BET, SEM-EDX, XPS and TEM, which reveals the presence of inorganic bases viz. oxides and carbonates of metals like Na, K, Ca etc. having the highest amount of potassium content. The catalyst was found to be highly basic (pH> 12) due to presence of alkali metals and hence are attempted as solid heterogeneous base catalyst for solvent free Cross-Aldol reaction. The progress of the reactions were observed by TLC and the obtained products were characterized by FT-IR and ^{1}H NMR techniques. The banana derived ashes is found to be effective as the heterogeneous base catalyst in Cross-Aldol reactions giving satisfactory yields at 30 wt.% and the catalysts are environmental benign in nature and easily separable from the reaction mixture by simple filtration.

Keywords: Agro-waste, heterogeneous base catalyst, banana peel/rhizome ashes, Cross-Aldol reactions.

Biography of the presenting author:

Dulu Brahm completed M.Sc. in Chemistry from IIT Guwahati.

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EMNSD 2020/OP/26

Structural Evaluation of Muga silk protein by experimental and computational approach

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Abstract

Silk from *Bombyx mori* is well exploited and found to be a remarkable proteinaceous biomaterial in the biomedical field. Whereas non-mulberry silk is comparatively less explored for biomedical application. Recently non-mulberry silk was found to be more advantageous than mulberry silk i.e., *B. mori*. And within the non-mulberry silk, the muga silk was known to have the highest tensile strength, resistance for strong acids, high UV absorption, and thermal properties, etc.

To start with the understanding of the structure of muga silk, muga silk fibroin protein was extracted and analysed experimentally using FTIR, CD, and DSC. For the computational approach, the 3D structure of muga silk is unavailable in PDB. Hence, by using different computational tools we can predict the 3D structure of muga silk protein considering *B. mori* 3D structure as a homology model through the SWISS-MODEL server. The model's quality was evaluated by selecting a higher Z score model. Then the 3D structure was analysed by RAMPAGE, Molprobity, and VADAR. From both the approach it was confirmed that the MSF contained higher β-sheets compared to BSF of moderate quality.

Keywords: Muga silk, 3D structure, secondary structure, PDB.

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Adarsh Gupta, K., Mita, K., Arunkumar, K. P., & Nagaraju, J. (2015). Molecular architecture of silk fibroin of Indian golden silkmoth, Antheraea assama. *Scientific Reports*, *5*, 1–17. https://doi.org/10.1038/srep12706

Biography of the author: Research scholar at the Central University of Gujarat working under the supervision of Dr. Indrani Banerjee. My Ph.D. topic is "Microwave-assisted synthesis of silk-based nanoparticles and its Applications". I have completed B.Sc. and M.Sc. in Biotechnology and M.Phil. in Nanoscience.

EMNSD 2020/OP/27

Optical and Electrical Properties of CuO Nanoparticles Synthesized Using *Citrus Maxima* Peels

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Abstract

In this communication, we report green synthesis of copper oxide nanoparticles (CuO NPs) using aqueous extract of *Citrus maxima* (pomelo) peel. The formation CuO NPs were characterized by powder XRD, FTIR, UV-visible spectroscopy, Photoluminescence, SEM and EDS. The XRD patterns indicated that the crystalline structure of CuO was monoclinic with the average crystalline size of 90 nm. The SEM image confirm the formation of spherical shape of CuO NPs. FTIR and EDS analysis revealed the purity of synthesized CuO NPs. The optical band gap of CuO NPs was estimated from UV-Vis diffuse spectroscopy analysis using Tauc's plot and it was found to be 1.5eV. The I-V characteristics curve of CuO NPs under illumination condition showed good photo response behavior, which might be due to the maximum number of exciting photoelectrons.

Keywords: *Green synthesis; CuO Nanoparticles; Citrus maxima; Optical band gap*

Biography of the author:

Sanjib Kumar Baglari received M.Sc from Gauhati University and M.Tech from IIT Kharagpur. He has more than seven-year teaching experience at UG level and currently working as Assistant Professor in the Department of Physics at Birjhora Mahavidyalaya, Bongaigaon, Assam. He is also pursuing his Ph.D degree at CIT, Kokrajhar, Assam. His research interest is in the field of material science like Conducting Polymers, Biomaterials, Nanomaterials etc. He has published three scientific peers reviewed international journal papers and presented many research papers at national and international conference.

EMNSD 2020/OP/28

Nanoparticle analysis using Digital Image Processing

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Abstract

Nanoparticles are ultrafine units measured in nanometers. Due to their size nanoparticles have unique characteristics. Nanoparticles may exist in nature or maye be manufactured due to many practical applications in various areas like textile, industry, medicine etc. But there may be potential human or animal risks as various health hazards like poisoning or unwanted neurological effects due to the nanoscale of the particles may causes due to the amount to be used by an organization. Goverment policies are there to regulate the concerned authorities. But as a safety measures it is vary much essential to do measure on the nanomaterials containing particles and so cause for proper adjusment of quantities of nanoparticle used and their analysis. Various existing microscopic measuring methods like scanning electron microscopy(SEM), transmission electron microscope(TEM) analysis are suffering from various drawbacks[1][2]. So it is essential to perform digital image analysis on the nanomaterial for nano particles qualitative and quantative analysis. The aim of the this study is qualitative and quantitative analysis of SEM and TEM micrographs and applying digital image processing for development of computer program for automatic crack analysis of micrographs.

Keywords: Nanoparticle, Image processing, SEM, TEM, health hazard

References:

[1] J Mathias , Advantages & Disadvantages of Scanning Electron Microscopy, February 3, 2020. www. innovatechlabs.com,

[2] D. Saladra & M. Kopernik, Qualitative and quantitative interpretation of SEM image using digital image processing", Journal of Microscopy, Vol. 00, Issue 0 2016, pp. 1–23

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[4] Rafael Gonzalez, Richard Woods , Digital Digital Image Processing , 10 May 2017, 4th edition

Biography of the Presenting Author: Dr Minakshi Gogoi, Associate Professor, Computer Science & Engineering Department at GIMT, Guwahati did her M.Tech in 2005 and PhD in 2015 from dept. of Computer Science and Engineering, Tezpur University, Tezpur. Her research areas include Image Processing, Biometrics authentication, Artificial Intelligence. She has published more than 20 research papers in International/ National Journals, and conferences. She has also served as a reviewer of many Internationally reputed journals. She is acting as a member of professional bodies of India like Institute of Engineers, India and Indian Society for Technical Education (ISTE). She also authored a book on "Biometric Promaneekoron", publisher Tezpur University and many book chapters.

EMNSD 2020/OP/29

TL Dating of Potsherds from Tumu Ching, Manipur, India

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Abstract

Recent excavation at the ancient iron smelting site of Tumu ching, Manipur, India revealed plenty of potsherds amidst the huge debris of iron slag indicating that ancient iron smelters were associated with pottery. Three different stratigraphic layers could be identified in the digging. Potsherds from the three layers have been dated by Thermoluminescence(TL) one of the most suitable physical techniques for estimating the ages of artefacts.

Potsherds from the first layer is estimated at 1976 ± 130 years which corresponds to about 44 CE, a period of the first king of Manipur Nongda Lairen Pakhangba, sample from the second layer is found to be 2085± 140 years which corresponds to about 65 BC and that for the third layer is 225 ± 125 years which corresponds to about 231 BC. This reveals that iron smelting started from the early part of 200 BCE and operational till the later part of the first cenuray AD. Physics has greatly contributed to the cultural heritage and hence, to authenticate the historical accounts.

Keywords: *Potsherds, Tumu ching, TL, Slag*

Dr. Raheijuddin Sheikh, did BSc from D M College of Science, MSc(Physics) from Manipur University, PhD(Physics) from Gauhati University, served as Associate Professor at D M College of Science, Principal at Manipur College, Director at DDU Centre for KAUSHAL, Principal at Kakching Khunou College and now serving as Principal Lilong Haoreibi College, published 7 academic books of which 'Physics for Cultural Heritage' has been lifted on amazon, 3 literary works of which one has been awarded, published more than 27 research papers in reputed journals. He has been trained under Australian TAFE Directors in Vocational Education Leadership Training (VELT) Programme in 2017-18.

EMNSD 2020/OP/30

Design And Simulation Of Non-metallic And Flexible Broadband Metamaterial Absorber For X-band Applications

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Abstract

The recent trends in technology have encouraged the fast and reliable data transfer, which in turn has increased the number of electronic and wireless devices. The exponential growth of these electronic systems, consequently, has led to the electromagnetic interference (EMI) of radiations that disrupt the performance of the source and end user devices. Recently, metamaterial has been studied as EMI absorbers in different frequency regime because of its unique properties like negative permittivity and permeability, which in turn exhibits excellent result in absorption in different ways. Considering the advantages of metamaterial, design of an efficient broadband metamaterial absorber composed of non-metallic expanded graphite based conducting layers and unit cells for X-band applications is present here. The conducting layers are separated by a flexible dielectric LLDPE substrate. The design and simulation is carried out in CST Microwave Studio. The structure is optimized to exhibits maximum absorption with minimum unit cell dimension and showing -1.96 GHz of -10 dB bandwidth in the X-band frequency range. Being designed on ultrathin, lightweight, flexible LLDPE substrate, the absorber can be used for different conformal applications.

Keywords: Broadband absorber, metamaterial, LLDPE

References:

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2. Schurig, D., et al. Metamaterial electromagnetic cloak at microwave frequencies, Science 314 (5801), 977--978, 2006.
3. Landy, N. I., et al. Perfect metamaterial absorber, Physical Review Letters 100 (20), 207402-1--207402-4, 2008.

Dipankar Borah was born on 2nd August 1991. He did his MSc from Indian Institute of Technology, Guwahati, India in 2014 and received his Ph.D in the field of EMI shielding from Tezpur University, Assam in 2020. He is currently working as Assistant Professor, B.N College, Dhubri, India. His main research interests are metamaterials, electromagnetic absorber etc. He has authored several papers in international journals and conference proceedings.

Poster Presentations

EMNSD 2020/PP/01

An Unsteady MHD Casson Fluid Flow Past An Accelerated Vertical Plate In Presence Of Thermal Radiation Through Porous Medium

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Abstract

In this chapter, an attempt has been made to investigate the boundary layer flow of on an unsteady MHD free convection heat and mass transfer flow of a viscous, incompressible and electrically conducting Casson fluid past an infinite vertical plate embedded in a porous medium. Casson fluid model is used to characterize the fluid behaviour. Exact solution of the governing equations is obtained in closed form by Laplace transform technique. The expressions for fluid velocity, fluid temperature and species concentrationare displayed graphically whereas the numerical values of skin friction, the Nusselt number and the Sherwood number are presented in tabular form for various values of pertinent flow parameters. The fluid velocity and fluid temperature are getting reduced due to heat absorption parameter. Heat absorption parameter has the tendency to reduce the skin friction at the plate. Furthermore, the surface shear stress increases with the increase in the Casson parameter.

Keywords: Nusselt number, skin friction, magnetic field, heat transfer, mass transfer, porous medium, velocity field.

References:

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4. Abid H., Anwar M.I., Farhad A., Khan I. andSharidan S. (2014):"Natural convection flow past an oscillating plate with Newtonian heating",*Heat Transfer Research*,Vol. 45,pp. 119–137

Biography of the Presenting Author: Dr. Anjan Kumar Deka pursed M.Sc ,M.PHIL ,B.Ed, Ph.D. from Gauhati University, Assam.He is currently working as Asstt. Teacher (science) in Normal School (Teacher Training Institute),Sootea, Biswanath Assam .He has published lots of research papers in reputed journals and conferences. His main research work focuses on Fluid Dynamics. He has 15 years of teaching experiences and 7 years of research experience.

EMNSD 2020/PP/02

A Review on Recoverable Magnetic Materials for Organic Transformation

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Abstract

This paper focuses on the review of recoverable magnetic materials for organic transformations. The magnetic materials as heterogeneous catalyst with easy recovery and reusability, play the key role in industrial requirements following sustainable environmental protocols. In addition, their application could be extended in power generation, electronic devices, analog and digital data storage, drug delivery, medical devices, and magnetic therapy, etc. Specially, magnetic iron based materials are effective for many catalytic reactions and used as catalysts to oxidative degrade of various organic pollutants in water. The catalysts are characterized by several techniques, such as powder XRD, BET, FTIR, UVi-Vis, SEM-EDAX, EPR, VSM, HR-TEM, etc. Among the different applications, we are interested for carbon-carbon bond formation reactions using magnetic material as a nano-heterogeneous catalyst. This powerful organic transformation reactions is highly important in organic synthesis in the areas of pharmaceutical, fine chemical, bio-fuel, etc.

Keywords: Magnetic materials, Heterogeneous catalysts, Nanocomposites, Organic Transformations

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Biography of the Presenting Author: Prior to join in Ph.D. program in Central Institute of Technology Kokrajhar, Assam; Anamika Baishya completed Master of Science in Chemistry from National Institute of Technolgy, Meghalaya

EMNSD 2020/PP/03

Frequency encoded All optical single bit memory unit using Tera Hertz Optical Asymmetric Demultiplexer(TOAD)

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Abstract

The operation of frequency encoded all optical single bit memory unit is described using Tera Hartz Optical Asymmetric Demultiplexer (TOAD) based interferometric switch[1,2]. Tera Hertz Optical asymmetric Demultiplexer (TOAD) is a fundamental optical switch in optical communication system. In frequency enencoding scheme, the states of information '0' and '1' are denoted by signals of frequency υ_1 and υ_2 respectively. The output of this single bit memory unit shown in the form of truth table in terms of wavelengths.

Keywords: TOAD, Frequency encoding, SOA, Memory unit.

References:

1. K Mukherjee, AK Meikap, D Kumbhakar "Frequency encoded all optical single bit memory unit using difference frequency generation alone" Optical and Quantum Electronics, 2012
2. S Dutta, S Mukhopadhyay "An all optical approach of frequency encoded NOT based Latch using semiconductor optical amplifier" Journal of optics, 2010

Biography of the Presenting Author: Mr. Kajal Maji is a Research Scholar of National Institute of Technology, Durgapur, India. He has obtained his M.Sc in Physics from Indian Institute of Technology Guwahati, India. His research interests are Optoelectronic device modelling and simulation. He has published 06 research papers in international journals and presented 05 research papers in national and international conferences.

EMNSD 2020/PP/04

Effect of Fe Substitution on the Magnetic Properties of $MnCo_2O_4$

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Abstract

Spinel compounds with general chemical formula AB_2O_4, containing two or more types of cations, have been studied for decades owing to their interesting electric, magnetic, optical and catalytic properties. Out of several spinel compounds, transition metal cobaltites MCo_2O_4 (M = Mn, Ni, Zn, Cu, Mg etc.) series have attracted significant interest for fundamental research and also for technological applications in many areas [1, 2]. In this report, we present the structural and magnetic properties of Fe doped $MnCo_2O_4$.

The $Mn(Co_{1-x}Fe_x)_2O_4$ (x= 0 - 0.5) compounds were synthesized by using sol-gel method. Rietveld refinements of the X-ray diffraction patterns show that all the sample exhibits cubic spinel structure with $Fd\bar{3}m$ space group. The lattice parameter is found to increase systematically with increase in the Fe concentration. Temperature dependent magnetization measurements under zero field cooled (ZFC) and field cooled (FC) conditions show large thermomagnetic irreversibility. These samples exhibit ferrimagnetic transition and the transition temperature, T_C is found to increase with increase in Fe concentration. The T_C for x = 0 and x = 0.5 samples are found to be 176 K and 446 K respectively. The *M-H* loops recorded for both parent and Fe doped samples show unusual hysteresis behaviour below a certain temperature. This unusual hysteresis behaviour is attributed to the domain wall pinning effect which is found to decrease with increasing Fe concentration. The saturation magnetization and the effective magnetic moment are found to increase with increasing Fe concentration as expected. The detailed analysis of the observed results will be presented.

References:

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EMNSD 2020/PP/05

Review On Metal Nanoparticles Embedded In Molybdenum Disulfide Nanosheets: Synthesis And Properties

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Abstract

Study of transition metal dichalcogenides (TMDCs) has become very crucial due to their wide range of applications in various fields such as sensors, supercapacitors, drug delivery, etc. Molybdenum Disulfide (MoS_2) nanosheet is a 2D TMDCs, which is considered to be an ideal substrate as it gets hybridized very easily in presence of functional groups which results in formation of MoS_2-based nanocomposites. Out of all the different types of MoS_2-based nanocomposites, Metal-MoS_2 nanocomposite display some unusual and extraordinary properties as the noble metal nanoparticles (NPs) shows Localised surface plasmon resonance (LSPR) which is responsible for unique optical properties in them and the nanocomposite combines both the merits of MoS_2 nanosheets and metal NPs [1]. Hence, these nanocomposites are used in wide range of applications. In this review, we will be focussing on the various techniques for synthesis such as self-assembly method [2], chemical reduction method [3], hydrothermal method [4], etc, used by different researchers for synthesis of Metal-MoS_2 nanocomposites such as Silver-MoS_2, Gold-MoS_2, Palladium-MoS_2 and Platinum-MoS_2. And we will also review some of the unique properties displayed by these nanocomposites.

Keywords: Molybdenum Disulfide, Metal-Molybdenum Disulfide, LSPR, Self-assembly, Chemical reduction, Hydrothermal, Properties.

References:

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Biography of the Presenting Author: Upama Das has completed her graduation in Physics from Cotton University with 1st class 1st rank. She did her masters in physics from Department of Physics, Gauhati University. She has recently joined the PhD. programme in Physics at Tezpur University. Her research interests broadly focus on nanostructures, soft matter, plasmonic.

EMNSD 2020/PP/06

Depletion width of Long Channel Normally On Junctionless Field Effect Transistor

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Abstract

This paper presents a mathematical model for depletion width of normally on Junctionless field effect transistor. The approach followed for obtaining the model is based on solving 1-D Poisson's equation under depletion approximation. A comparative analysis of depletion width of Normally on device with Normally off device is also presented. The dependance of depletion width on device dimensions, work function of gate material, dielectric constant of gate dielctric material, applied gate and drain voltages also presented in the paper.

Keywords: Field effect; Junctionless; Normally on; Normally off; Work function; Depletion width

References:

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EMNSD 2020/PP/07

Electro-Optic Performance of Smart Antiferroelectric Liquid Crystalline (AFLC) Compounds

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Abstract

Electro-optical investigation of three high tilted, fast switching AFLC liquid crystalline compounds has been performed by exploring its spontaneous polarisation, switching times, rotational viscosity and anchoring energy coefficients. The polarization reversal method has been used to measure the electro-optic parameters and characterized in 5-µm thick ITO-coated device cells [1-2]. Antiferroelectric liquid crystal compounds shows two types of phase sequence, isotropic - smectic A* - smectic C* - smectic C_A* and isotropic - smectic C_A* with unusually broad temperature ranges of Smectic C_A* phases of more than 100 °C. These material has sufficiently high spontaneous polarisation of the order of ~320 nC/cm^2 and switching times of ~300 µs. These compounds has low rotational viscosity in the range of 2-8 Pa.s. Viscosity is maximum in SmC_A* phase since with increase in the tilt angle the rotational hindrance barrier also increases, thereby increasing the viscosity. Maximum value of dispersion energy coefficient is ~ 0.032 Jm^{-2} and it decreases with increase in temperature. Weak W_d indicates a requirement of lower threshold voltage; therefore low electric field is required to switch the molecules between off and on state which is an important properties of switching devices. Maximum value of polarization coefficient is ~ 0.025 Jm^{-2}.

Keywords: Antiferroelectric liquid crystal, spontaneous polarization, relaxation times, viscosity

References:

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[2] M.B. Pandey *et al.* Dielectric and electro-optical properties of anti- ferroelectric liquid crystalline materials. Isr. J. Chemistry, 52, (2012), 895-907.

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EMNSD 2020/PP/08

How The Modified Winogradsky Microcosm Technique Can Help in Building An Indigenous Culture Collection Of Iron And Sulphur Bacteria Valuable In Green Synthesis Of Gold Nanoparticles

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Abstract

This paper describes an easy to use modified winogradsky microcosm (MWMC) technique for enrichment and isolation of useful chemolithotrophic bacteria which are increasingly employed in green synthesis of Gold nanoparticles. The technique was necessitated due to non availability of pure cultures of Iron and Sulphur bacteria in India and find out a way to help the scientists to build an indigenous culture collection of such useful chemolithotrophic bacteria. Winogradsky column is an example of an interdependent microbial ecosystem and is an excellent tool to determine the major bacterial communities in a sample. Winogradsky columns have been used extensively to demonstrate microbial nutrient cycling and metabolic diversity (Abbasian et al., 2015; Yu et al., 2020). This work was aimed at application of the Winogradsky Microcosm (WGMC) by modification using simple, low cost PET bottles to enrich microbial biofilms of Iron and Sulphur bacteria from different local mineral samples in order to isolate useful cultures of particularly Acidithiobacillus, Leptospirillum and Sulfobacillus spp. After prolong incubation in dark followed by exposure to light, interesting coloured zones were identified in 24 columns from six samples indicating differential colonization of biofilms of Iron and Sulphur bacteria. The biofilms were carefully sampled, microscopically analysed, aseptically processed, enriched and pure cultures of iron and sulphur bacteria were successfully obtained on specific hyperacidic media. These cultures have excellent potential in bioleaching of gold sulphides and green synthesis of pure Gold nanoparticles. Considering the dependence of our country on foreign nations to acquire such rare, expensive and patented cultures, our technique is claimed to be potentially helpful to Indian researchers to build an indigenous collection of industrially useful, diverse and chemically creative strains of Iron and Sulphur bacteria. The results are presented and discussed.

Keywords: Modified Winogradsky Microcosm (WGMC), Iron And Sulphur Bacteria, Green Synthesis, Gold

EMNSD 2020/PP/09

Excellent light trapping in nanostructured thin flexible Si wafer for potential solar cell application

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Abstract

Silicon solar cells dominate the photovoltaic market, owing to their reliability, high performance and proven technology. Demand for further lowering the cost by employing thin flexible Si wafer is the need for PV industry for different application. Reducing thickness of Si wafer will lower the absorption of desired solar spectrum for solar cell application. Conventional micro-pyramid texturing of Si to improve light absorption is not suitable for thin silicon wafers. Nanostructures (nanopillar, nanowire, nanopyramids) with small Si removal are proposed to minimize the reflection in thin Si wafer. This study proposes the preparation of thin/flexible crystalline-Si wafers by simple wet chemical alkali etching under various processing condition. Starting from the as-cut solar grade silicon wafer of thickness 180±20µm of (100) orientation ≤ 50µm thin wafers could be achieved which shows flexibility. Thinning of silicon wafer with KOH solution has dual role in both reducing the thickness as well as to remove the surface damage of the solar grade silicon wafers. The as-cut as well as thin wafers has reflection more than 35% in range 400-1100nm. To manage the light trapping for such thin flexible Si wafers nanostructuring by MACE was implemented which reduces the reflectance (SWR) by 2.78% which is 37.7% lower than non-structured thin flexible wafer.

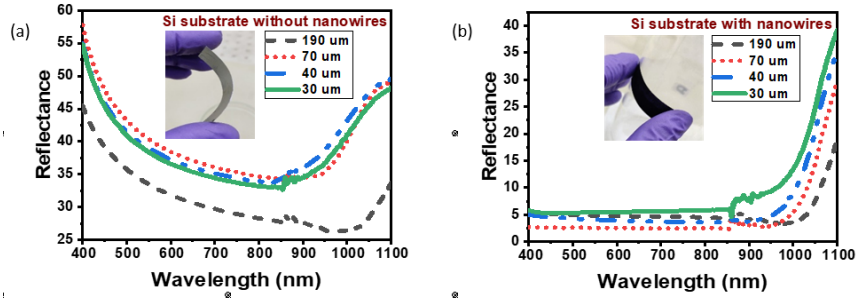

Fig: *Reflectance curves for Si substrate (a) without nanowires and (b) with nanowires*

Biography of the Presenting Author : Deepak Sharma is currently CSIR-Junior Research Fellow at CSIR-NPL, New Delhi pursuing Ph.D in AcSIR. His research aim is to develop cost-effective flexible Photovoltaic devices.

EMNSD 2020/PP/10

Solution processed synthesis of graphene oxide from natural graphite powder and its potential application in rGO/Si heterojunction solar cells

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Abstract

Silicon solar cell technology still dominates the solar PV market globally. Recently, Si based heterojunction solar cells with integrating different novel materials is a incredible subject of interest for low cost and high efficiency devices. Graphene, a 2D allotrope of carbon is a promising material for this purpose with its eminent properties, including its high carrier mobility, high flexibility, high stability, and excellent optical transparency. Chemical exfoliation of natural graphite powder gives a best solution for large scale synthesis of graphene. In this approach firstly graphene oxide (GO) is synthesized via chemical oxidation of graphite and then chemical exfoliation and reduction of GO flakes is performed for formation of reduced graphene oxide (rGO). rGO has great comparability in properties with graphene and can be utilized as an inexpensive alternative to it. In this study, graphene oxide was synthesized via modified hummers method and further reduction was performed by ascorbic acid (vitamin c). Prepared GO flakes was dispersed in DI water which shows high solubility and stability. The structural properties of the prepared GO flakes were studied via Raman spectroscopy and UV-Vis NIR spectroscopy as shown in Fig.1(a) and (b) respectively. The simple synthesis process of GO/rGO could be used as efficient hole transport layer for Si heterojunction solar cells.

Keywords: rGO,Si heterojunction, Hummer's method

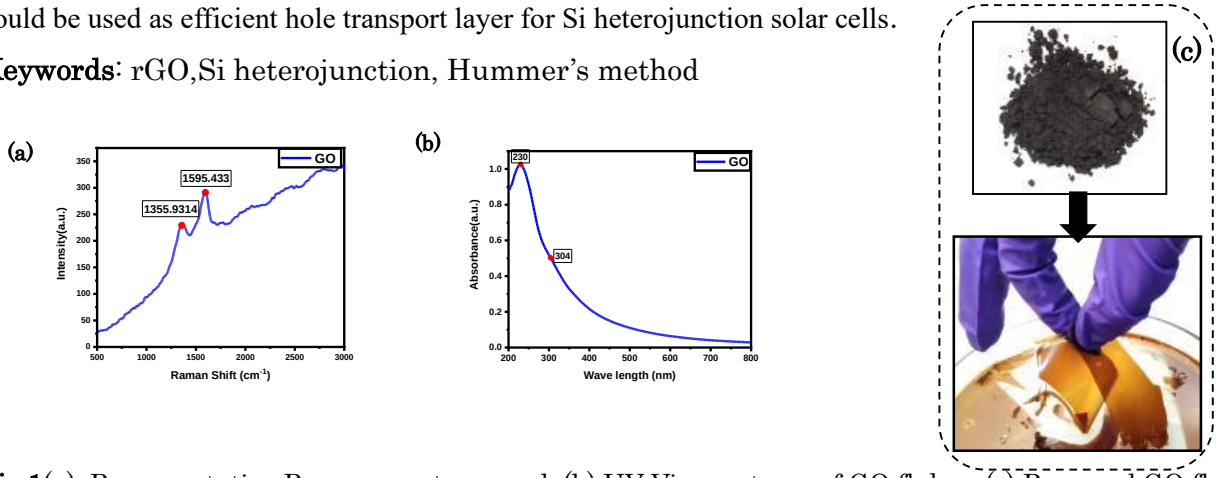

Fig.1(a). Representative Raman spectrum and, (b) UV-Vis spectrum of GO flakes, (c) Prepared GO flakes

Biography of the Presenting Author: Ruchi K. Sharma is currently UGC junior research fellow at CSIR-NPL, New Delhi pursuing Ph.D in ACSIR. Her research aim is to develop cost-effective hybrid solar PV devices.

EMNSD 2020/PP/11

Optimization of fermentation conditions for microbial cellulose production isolated from Lepidopteran insect gut

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Abstract

Enzymatic hydrolysis of cellulose by microorganisms is a key step in global carbon cycle. Microbes present inside insect gut play critical roles in host nutrition and physiology. The order Lepidoptera that includes moths and butterflies, one of the most recognizable insect groups, still their microbial symbionts are little-studied. This study was conducted to isolate, screen and identification of cellulase producing bacteria present inside Lepidopteran moth *Kunugia latipennis* gut. Characterization of bacterial isolates was done based on morphological and biochemical analysis. Cellulolytic bacteria were isolated and cultured in CMC (Carboxymethyl cellulose) media. The biochemical characters were assayed. Cellulolytic activity was determined based on formation of clear zone and cellulolytic index on CMC plate media. The proper culture conditions for microbial cellulase production from the gut of herbivorous insects were optimized. The properties of the cellulase were investigated by DNS method. The experimental data indicated that suitable culture conditions for cellulase production were the culture temperature of 32°C, the pH of 6.5 the incubation period of 72hours and loaded volume of 50ml per 250ml. The optimum reaction temperature and pH were 50°C and 6.5 respectively containing 2% CMC. This enzyme thus concluded to be slightly acidic cellulase.

Keywords: Enzymatic hydrolysis, *Kunugia latipennis,* cellulase, CMC (Carboxymethyl cellulose), DNS method

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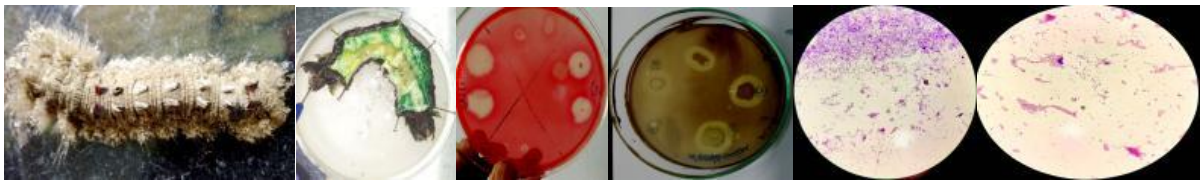

Figure1.: (a) *Kunugia latipennis* larva, (b) incised gut of larva, (c) CMC agar palte stained with Congo Red stain, (d) CMC agar palte stained with Gram's Iodine Stain, (e) Gram's staining, (f) Gram's staining

Biography of the Presenting Author: The presenting author is a Doctoral Scholar in the Department of Environmental Studies, North-Eastern Hill University, Shillong. She has completed her Master of Science in Molecular Biology and Biotechnology from Tezpur University. The author is eligible for LECTURERSHIP (NET) conducted by Joint CSIR-UGC in the subjest of Life Science.

EMNSD 2020/PP/12

Sustainable Heterogeneous Catalyst for Carbon-Carbon Bond Formation Reactions: A Critical Review

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Abstract

Utilization of sustainable agro-waste biomass provides the alternative biodegradable reagent in organic synthesis. The conversion of biomass into value-added chemicals or materials is the challenging task for the researchers. There are several types of agro-waste such as Water Hyacinth, Musa balbisiana Colla, Rice straw, Papaya Bark, Brassica nigra, Sesamum indicum, Heteropanax fragrans (Kesseru), etc. The ash &water extract of these ash provides the both basic and green reaction media in the system. This is the main advantage of such system, replaces the toxic organic solvents and hazardous homogeneous base-catalyzed organic reagents. In this paper, we are discussing for several types of carbon-carbon bond formation reactions using agro-waste as heterogeneous catalyst and green reaction media.

Biography of the Presenting Author: Sudem Borgayary is a research scholar of Dept. Of Chemistry in CIT, Kokrajhar. He has completed his master's from BODOLAND UNIVERSITY, Kokrajhar, Assam, India in 2019.His research interests include Heterogeneous Catalysts, Renewable Energy, Waste to Value-added chemicals, Biomass, Bio fuel & Pyrolysis.

EMNSD 2020/PP/13

Investigation of structural and magnetic properties of cobalt ferrite nanoparticles for hyperthermia therapy

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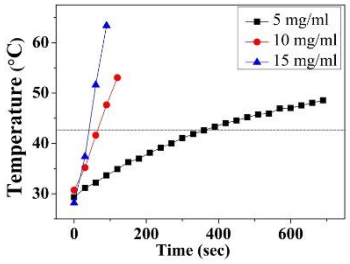
Abstract

Cobalt ferrite ($CoFe_2O_4$) nanoparticles were synthesized by conventional sol-gel auto combustion method. The analysis of X-ray diffractogram and Raman spectra confirmed the formation of desired crystallographic phase of the sample. Scanning electron microscopy and high resolution transmission electron microscopy with energy-dispersive X-ray spectroscopy were used to characterize the morphological and elemental properties of the sample. The average particle size around 15 nm were evaluated from observed micrographs, which agrees well with the results obtained from X-ray diffractogram. Magnetic hysteresis loop at 300 K suggests the presence of superparamagnetic particles along with ferrimagnetic particles. Saturation magnetization, coercive field were also evaluated. In order to explore the biomedical application of the cobalt ferrite nanoparticles inductive heating of the nanoparticles at different concentrations were measured. It suggests that cobalt nanoparticle would be useful for magnetic hyperthermia therapy. [1]



Keywords: Spinel ferrite, Magnetic nanoparticles, Hyperthermia therapy

References: [1] Y. S. Srinivasan, K.M. Paknikar, D. Bodas, V. Gajbhiye, *Applications of cobalt ferrite nanoparticles in biomedical nanotechnology*, Nanomedicine **13** (2018) 1221–1238.

Acknowledgement: The authors wish to acknowledge the financial assistance provided by DST-SERB, Govt of India (Order No: EMR/2017/000832, Dated: 19.03.2018).

Biography of the Presenting Author: Research Scholar, Department of Physics, University of Burdwan, West Bengal, India.

EMNSD 2020/PP/14

High Power Analysis of A Junctionless Field Effect Transistor With High K Spacer and Low Work Function Gate Material

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Abstract

This paper presents a high power analysis of Junctionless field effect transistor (JLFET) with High K Spacer and Low Work Function Gate Material. The structure consists of Hafnium Oxide (HfO_2) as spacer. The work function of the gate material is selected in such a way that the device is Normally off in the absence of externally applied gate field. The high K spacer helps in reducing off-state leakage while low work function gate material results reduction of on-state loss making the device suitable for high power applications. Various performance parameters such as off current, on-state resistance etc of the proposed structure are compared with conventional JLFET and Power Metal oxide semiconductor field effect transistor (MOSFET) on Cogenda VisualTCAD 1.8.2 simulation platform. The simulation results shown that the device exhibits lower off current, lower on-state resistance and lower subthreshold swing compared to that of conventional JLFET and Power MOSFET.

Keywords: High power; JLFET; Low work function; High K Spacer

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Biography of the Presenting Author: Anjanmani Baro received her B.Tech. degree in Instrumentation Engineering in the year 2014 from Gauhati University, India and M.E. degree in Instrumentation and Control from Dibrugarh University, India in the year 2016. Presently she is working towards Ph.D. degree in the Department of Instrumentation at CIT Kokrajhar, India.

EMNSD 2020/PP/15

A Review on Layered Graphene Oxide and Transition Metal Dichalcogenides material : Synthesis and application in memory devices

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Abstract

Two-dimensional layered materials such as graphene oxide (GO) and transition metal dichalcogenides (TMDs) have attracted growing attention due to their excellent physical and structural properties and have been considered as a promising candidate in photonics, electronic, energy storage, sensing, optoelectronic devices. Here, different synthesis processes of layered materials have been reviewed. Recent progresses of non-volatile memory devices based on these materials with and without polymer have been discussed and trying to focus on memory characteristics such as I_{on}/I_{off} ratio, switching voltages, endurance, retention which are very important parameter for designing next generation electronic devices.

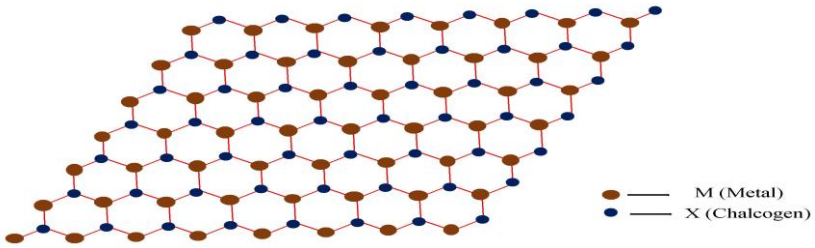

Fig.1 Schematic diagram of MX_2 (Metal dichalcogenide)

Keywords:Graphene oxide, transition metal dichalcogenide, layered, endurance, retention

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Biography of the Presenting Author: Nipom Sekhar Das, Scholar Id: 18-3-24-104, Ph. D. 5 th semester, Department of Physics, National Institute of Technology Silchar, Assam-788010, India.

EMNSD 2020/PP/16

Recovery and identification of bioactive limonin from Pomelo (Citrus grandis) seeds using organic solvents

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Abstract

Citrus limonoids are potentially bioactive compound present in citrus fruits. Limonin a citrus limonoid having a number of biological activities is practically extracted from citrus seeds due to its highest content in the seeds of the citrus fruits. In the present study, pomelo (Citrus grandis) seeds were investigated for limonin recovery using a process consisting of acetone extraction, ethanol washing , purification using isopropyl alcohol and sodium hydroxide and finally crystallization. The extraction efficiency depends on three key factors which were concentration of hydrotope, extraction temperature and extraction time. After initial study of extraction with optimization, acetone solvent dosage of 80 ml was used with extraction time and temperature as 4 hours and 80^0 C respectively. The limonoid yield was 0.0031g/g (approximately). The structure of isolated main constituent of the limonoids was identified by Fourier transform infrared (FT-IR) spectrometer.

Keywords: Limonin, extraction, pomelo seeds

References:

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Biography of the Presenting Author: Satyajit Das is currently working as an Assistant Professor in the department of Electronics and Telecommunication Engineering at Jorhat Institute of Science and Technology, Jorhat, Assam. He is pursuing his PhD degree from department of ECE, Tezpur University, Tezpur, Assam

EMNSD 2020/PP/17

Estimation of radon exhalation rate in soil samples of oil field area of Tinsukia District of Assam and its possible correlation with radium content in soil using Can technique method

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Abstract

Radon activities and radon exhalation rates have been measured in soil samples collected from different locations of oil field area of Tinsukia District (Digboi) of Assam, India. 'Can Technique' using LR115 (type II) detectors, has been used for the estimation of radium concentration & radon exhalation rate. Radium concentration observed for soil samples has been found to be varying from 1.33 Bq/Kg to 1.6 Bq/Kg .The Radon exhalation rate in these samples has been found to be varying from 0.834 to 0.998 $mBqm^{-2}$ h^{-1}.A positive correlations with (R^2 =0.99) have been found between radon exhalation rate and radium concentration in the samples for the investigated area. The obtained results indicate normal levels of indoor radon concentration and effective radium content in all locations of the studied area. Life threats to the dwellings in the particular area.In the importance of a study of radon has been recognized globally. So we have taken up a study to compare the radon datas with respect to our present study. Institutions like EPA, WHO, ICRP and many more world recognized organizations have taken up the study of radon and its importance.So,a qualitative analysis and comparison is highly essential in context to world concern.

Keywords: Can technique, radon exhalation, emanation, effective radium content

EMNSD 2020/PP/18

Production of chitinase by *Pseudomonas aeruginosa* strain R1-73 isolated from soil and its potential use as a biopesticide

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Abstract

The continuous use of chemical fertilizers have resulted in pollution of the environment in general, besides posing problems to human health and the survival of non target organisms through persistence and bioaccumulation in the food chain. Therefore there is a renewed focus in research towards development of environmentally safe biopesticides. The use of chitinases as a bio control agent is considered to be an environmentally safe strategy. Chitinases are a group of enzymes produced by microorganisms and belong to the class of hydrolytic enzymes with a potential to inhibit or degrade the chitin contained in pathogens like fungi, and pests insects and their larvae. The present study explores the natural ability of *Pseudomonas aeruginosa* strain R1-73 to utilize chitin as a source of energy. The chitinase producing bacterial microorganisms were isolated from soil and screened for chitin degradation. The strain eliciting highest chitinase activity was selected for future use. It was identified as *Pseudomonas aeruginosa* strain R1-73 through PCR amplification of 16S rDNA and subsequent similarity search using Basic Local Alignment Tool (BLAST) and phylogenetic analysis using Molecular Genetic Analysis Tool. The study demonstrates the potential of using crude extracts of chitinase from *Pseudomonas aeruginosa* strain R1-73, as a biopesticide when used against *Bombyx mori* larvae as a model.

Keywords: Chitinase, *Pseudomonas aeruginosa*, *Bombyx mori*, Biopesticide

EMNSD 2020/PP/19

A Study On The Role Of Plasmonic Nanostructures In Enhancing Photocatalytic Performance Under Visible Light

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Abstract

The fascinating phenomena of light trapping and charge carrier generation-separation due to surface plasmon resonance (SPR) has attracted great interest in the field of plasmonics. The understanding of efficient plasmonic nanostructures and the parameters that affecting the plasmonic properties of the nanostructures is very crucial for efficient application in solar photocatalytic and photovoltaic applications. In this study, the recent advancement on plasmonic nanostructures in enhancing photocatalytic performance under visible light irradiation and various plasmonic material systems have been demonstrated thoroughly. Plasmonic nanostructures can serve as an antennas to convert light into localized electric fields (E-fields) on the metal surface.The strong interaction between incident light and free electrons in the nanostructures smaller than incident wavelength give rise to the localized surface plasmon resonance (LSPR). It is found that controlling the nanostructures in terms of size, shape and its surroundings, one can tune the plasmonic resonance frequency, achieve optimal absorption to scattering ratio, and enhance broad band spectral absorption. The geometrical symmetry of the nanostructures also have important role in tuning and building up the LSPR modes. The metal nanostructures with irregular shape has been seen to have multiple resonant peaks due to the multipolar resonances in different directions which may facilitated the broad absorption of the solar radiation spectra.

Keywords: Plasmonic Nanostructures; Photocatalysis; Visible Active.

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EMNSD 2020/PP/20

Three input NOR GATE using Quantum Dot Semiconductor Optical Amplifier (QDSOA)

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Abstract

A 3-input logic optical NOR gate is designed and analyzed. Quantum Dot SOA is an important element in optical signal processing nowadays and has the capability of replacing conventional SOA. It has advantages of low gain recovery time, high saturation etc[1,2]. The present paper analyzes the optical NOR gate by calculating Extinction Ratio (ER), eye opening etc.

Keywords: Quantum Dot SOA, Optical logic, Extinction Ratio.

References:

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Biography of the Presenting Author: Siddhartha Dutta, have completed M.Sc. in 2012 from Visva-Bharati and qualified NET Exam in 2015. Now I am doing research in Visva-Bharati on optoelectronics. The above mentioned authors are my guide.

EMNSD 2020/PP/21

Reversible Transformation and Nonautonomous Soliton in Inhomogeneous Plasma

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Abstract

In many laser plasma irradiation experiments plasma is both inhomogeneous and nonlinear to large amplitude plasma waves. The large amplitude wave packet modifies the plasma density through the action of ponderomotive force. The modification significantly change the wave packet propagation in an inhomogeneous plasma. We propose a generalized reversible transformation between the generalized nonlinear Schrödinger equation (NLSE) and the generalized forced NLSE. Exact solution of forced NLSE accelerated in an nonuniform medium are obtained. The solution in the from of soliton can successfully describe the propagation of wave packet in inhomogeneous plasma.

We further extend the reversible transformation to the nonautonomous NLSE hierarchy. We obtain soliton solution of the forced higher order NLSE using the reversible transformation. The reversible transformations allow us encompassing inhomogeneous NLSE hierarchy belonging to the class of nonisospectral family of inverse scattering problems into the family of isospectral NLSE class of equations and study them under a general mathematical framework. Our analysis provides a mathematical platform to study inhomogeneous NLSE hierarchy and their applications without solving the nonisospectral inverse scattering problem.

Keywords: Reversible Transformation, Nonautonomous Soliton

References: Sudipta Nandy, Gautam K. Sahariah, Abhijit Barthakur, Optik, Volume 223, 2020, 165452, ISSN 0030-4026, https://doi.org/10.1016/j.ijleo.2020.165452.

Biography of the Presenting Author:

Gautam Kumar Saharia completed M.Sc. in Physics from Cotton University, Guwahati

EMNSD 2020/PP/22

Synthesis of Reduced Graphene Oxide by using Ammonia for optical sensors and electronic devices

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Abstract

Graphene has attracted significant attention because of its excellent electrical, mechanical, and optical properties. Graphene can be produced by different methods like mechanical exfoliation of graphite, chemical vapor deposition(CVD), chemically reducing graphene oxide (GO), etc. Though the first two methods produce high-quality graphene with relatively perfect structure and excellent properties, the processes are expensive and required high temperature in comparison to the chemical process, also a very minimal amount of graphene can produce using the above processes. So, the researcher has mainly focused on the low-cost bulk production of graphene using chemical processes. In this work, graphene oxide was successfully synthesized by using modified Hummer's method and reduction of graphene oxide has been done by using Ammonium Hydroxide. Different characterization methods, FTIR, Raman spectroscopy, XRD, EDX, SEM, UV-VIS spectroscopy were used to analyze the structural, chemical, electrical, and optical properties of the resulting material. In the synthesized reduced graphene oxide (rGO), the direct bandgap is reduced to 3.55 eV from 4.06 eV of GO and shows the conductivity of 19.1 Sm^{-1} and the resistivity of 5.23 ohm-m at room temperature. The synthesized rGO shows the property of semiconductors, which can be used in different sensors and electronic devices.

Keywords: rGO, FTIR, XRD, Raman Spectroscopy, UV-vis spectroscopy.

References:

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[2]. Botas, C. et al.; *Carbon*, *65*, 156-164, 2013.

[3]. Paulchamy, B. et al.; *J Nanomed Nanotechnol*, *6*(1), 1, 2015.

Biography of the Presenting Author: Palash Phukan received M.Tech degree in Electronics Design and Technology from Tezpur University, Assam. He is currently pursuing Ph.D degree with ECE depertment, Tezpur University. His research interest include synthesis of Graphene, optical nano materials/nano-composite and fabrication of optical sensor, solar cell and energy storage.

EMNSD 2020/PP/23

Fabrication of Silk based nano-materials for bio-medical applications: A Review

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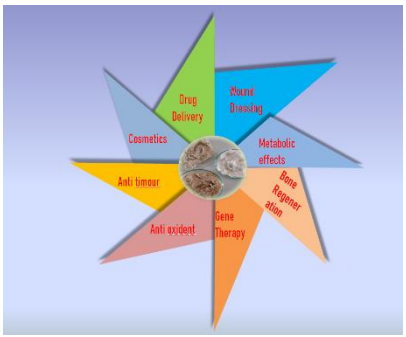
Abstract

The versatility and flexibility of silk-based nanomaterial offer a strong platform for fabrication of composite materials in the line of sustainability. The excellent physical properties, unique surface morphology, chemical compositions along with exceptional quality like biocompatibility, biodegradability and non-toxicity make the materials suitable for biomedical convenience. In this work, we are presenting the critical review on biomedical application of silk based nanomaterils. Further, we are interested to focus on nonmulberry silkworm as it is abundant in Northeast region of India whereas India is in second position in the production of silk in the world, so it has been attracting researchers in tailoring versatile materials. Literature survey reports the bright prospectus of using silk based nanomaterial especially in pharmaceuticals and cosmetics. This review summarizes recent advances of silk-based materials in bio-nanotechnology.



Keywords: Silk, Nano-particle, Bio-medical

References:

1. Silk Fibroin based biomaterials for bio-medical applications: A Review, Thang Phan Nguyen (2019)
2. Silk proteins for Bio-medical applications: bioengineering perspective, Banani Kundu

Biography of the Presenting Author: Passed M.Sc from Bodoland University in 2018. Currently, he is pursuing Ph.D. in the Department of Physics, CIT Kokrajhar.

EMNSD 2020/PP/24

Synthesis & characterization of coir fiber reinforced geopolymer composite

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Geopolymers are a class of inorganic polymer that can be produced by the reaction between an aluminosilicate source material and an alkaline solution**.** Geopolymeric materials can exhibit a wide variety of properties such as high compressive strength, low shrinkage, thermal stability, chemical resistance etc. but it also shows relatively low tensile, flexural strength. To emit these issues, the geopolymers are synthesized with coir fiber. Coir fiber reinforced geopolymer composite recently gain attention due to easy availability, biodegradability, low carbon-di-oxide emission etc. This article focuses on the evaluation of coir fiber as reinforcement of a fly ash and slag based mixed geopolymer matrix. Reinforced matrices different contents of coir (ranging from 0.25 to 1 wt%) were produced to study the effect of the fiber content on the physical, mechanical, morphological properties etc. The results show that appropriate addition of coir fiber can improve the mechanical properties of geopolymer composite due to strong fiber matrix adhesion.

Keywords: Fly ash & slag based geopolymer composite, coir fiber, morphology, mechanical properties.

References: [1] K. Korniejenko et al, Mechanical properties of geopolymer composites reinforced with natural fibers. [2] Guido Silva et al, Natural fibers as reinforcement additives for geopolymers – A review of potential eco-friendly applications to the construction industry.

Fig 1: Treated coir fiber

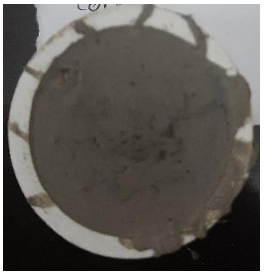

Fig 2: GP composite

Fig 3: GP composite after test

Biography of the Presenting Author: Abhijit Roy, M.Tech (Pursuing), Department of Material Science & Engineering, Tripura University (A Central University, Tripura, India-799022

EMNSD 2020/PP/25

The Study of upgraded Optical Properties with Aligned Silicon Nanowire

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[2]*Department of Applied Sciences, Kamla Nehru Institute of Technology, Sultanpur, 228118, Uttar Pradesh, India*

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Abstract

From the decade the work in the field of SiNW has been going with a great enhanced properties by giving a open door research in optoelectronic properties .Here we have fabricated the aligned silicon nanowire (A-SiNW) by varying the etching time of Si wafer with metal electrodeless wet chemical etching method (MEWCE) which is very much beneficial method with the reason behind its less fabrication cost and its simplicity. A-SiNW has its many application majorly its biological applications, sensors, anti reflection coating (ARC) properties that is useful in the wide area of electronics. We will disscuss here mainly the antireflection properties in the detail. The antireflection properties gave the great boost to the energy saving world. The fabrication of A-SiNW has been confirmed with field effect scanning electron microscopy (FESEM) and XRD analysis.

EMNSD 2020/PP/26

Investigation of dynamics of a driven coupled order parameter system

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Abstract

The rich chaotic dynamics exhibited by sinusoidally driven nonlinear oscillators are ubiquitous to a large number of systems such as turbulence in fluid systems, cardiac tissues, chemical oscillators and biological systems. Recently, Sarmah et al. had developed a unified coupled nonlinear oscillator model involving magnetization and strain as order parameter to represent the dynamics exhibited by driven magnetostrictive ribbon **[1,2]**. In this work, a detailed investigation of the model is carried out to observe the nonlinear parametric effects on the rich dynamics exhibited by the coupled order parameter model. In particular, the model shows a period-doubling route to chaos as a function of a static field for the fixed amplitude of oscillating field as well as a quasiperiodic route to chaos as a function of an oscillating field for a fixed static field for a range of physically accepted parameters. Interestingly, the system also exhibits a direct transition from period one orbit to chaos. Besides, the model also shows induced and suppressed chaos under the influence of an additional small-amplitude near-resonant oscillating field. Our analysis suggests richer dynamics in coupled order parameter systems like magneto-martensites and magnetoelectric materials.

Keywords: Order parameter, Magnetostrictive ribbon, Chaos

References:

[1] R. Sarmah, G. Ananthakrishna, PRE **86**; 016204 (2012); Chaos **23**, 013116 (2013), CNSNS **19**, 3880-3891 (2014)

[2] S.T. Vohra et al, Phys. Rev. Lett. **66**, 212 (1991); J Appl Phys **69**, 5736 (1991); Phys. Rev. Lett. **70**, 1425 (1993).

Biography of the Presenting Author

Sita Chettri is the research scholar of the Department of Physics, Tezpur University since July 2019. She is working under the supervision of Dr. Ritupan Sarmah, Assistant Professor, Tezpur University

EMNSD 2020/PP/27

A DFT Investigation of Adsorption of Small Molecules on Graphene Supported Gold Atom

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Abstract

Graphene consists of a single layer of sp^2 hybridised carbon atoms arranged in a hexagonal crystal structure.[1] It has remarkable properties. It is a very high-surface material. The high surface area makes it an ideal material for adsorption processes. The interaction between an adsorbate and a surface depends upon the charge transfer between them. This charge transfer can be enhanced by adsorbing metal nanoclusters or atoms on the graphene surface and then absorbing small molecules onto the nanocluster. In this study we investigate the adsorption of small molecules on graphene supported gold atom using density functional theory. We have used a pristine grahene sheet containing 43 carbon atoms. The DFT calculations have been performed with RPBE functional and DNP basis set using $DMol^3$ programme. All electron scalar relativistic calculations are performed with pseudopotential VPSR as implemented in the programme. The optimized structure of CO molecule adsorbed on the graphene supported gold monomer gold atom is shown in the figure below. The C-Au distance is found to be 2.656 Å.

Similarly, NO molecule will be adsorbed on graphene supported Au atom and its interaction with CO will be studied

Keywords: DFT, Graphene, Grpahene supported Au atom, adsorption

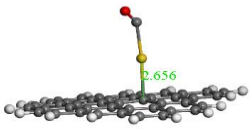

Fig 1. Optimized structure of CO adsorbed on graphene supported Au atom

References:

[1] F. Perreault, A. F. de Faria, M. Elimelech, Chem. Soc. Rev. 44 (2015) 5861-5896.

Biography of the Presenting Author

Prem Prakash Sahu completed his Masters in Chemistry(Inorganic Specialisation) in 2019 from Cotton University, and BSc(Major) under Gauhati University in the year 2017. Presently he is working as Project Assistant under Dr. Ajanta Deka, Assistant Prof & HoD, Dept of Physics, Girijananda Chowdhury Institute of Management and Technology.

EMNSD 2020/PP/28

Atrazine removal by ZnO nanoparticle from aqueous solution

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Abstract

Pesticide like atrazine is considered as an emerging water contaminant generally mixed with ground and surface water by agriculture runoff or by industrial effluents. The toxicity of atrazine may affect human health or others adversely. Various methods are available to treat such type of water pollutant to make it safer use. Various research efforts have been applied for adsorption process, considered as a promising method for water treatment due to its cost effective and simple operation. In the present study, ZnO nanoparticle and ZnO-MgO nanocomposite have been synthesized, characterized and used as an adsorbent. Continious column adsorption process was used for atrazine removal. ZnO nanoparticle has high surface active sites, high band gap and chemical stability. In the range of 5 to 50 nm ZnO particle size was obtained. The nanoparticle and nanocomposite were characterized by XRD, TEM and FESEM etc. Higher removal efficiency was observed for both the cases. The spent adsorbent was regenerated and reused for further study.

Keywords: Atrazine removal, nanoparticle, column adsoprtion

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Ali, I., ALOthman, Z.A. & Al-Warthan, A. Int. J. Environ. Sci. Technol. (2016) 13: 733

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Biography of the Presenting Author: Dr. Piyali Roy Choudhury, PhD- Chemical Engineering, currently working as teaching fellow at MIT campus Anna University in the Department of Rubber and Plastics Technology

EMNSD 2020/PP/29

Recycling of E-Waste Derived Printed Circuit Boards

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Abstract

E-waste, or waste electrical and electronic equipment, is an emerging and fast-growing waste challenge to waste management in both developed and developing countries. Rapid technology innovation, miniaturization, replacement and ever-shortening product life spans are among the factors contributing to the growing amount of e-waste. India is the third largest electronic waste generator in the world after China and the USA and these three countries together contributed 38% of total 53.6 million tonnes (Mt) of e-waste, generated worldwide in 2019. Utilising this e-waste as a resource will provide an effective alternative to use of conventional raw materials. E-waste in particular Printed circuit boards (PCBs) are prevalent in almost every electrical and electronic gadget. PCB is a complex structure to assemble and also to dismantle, as it is built by using both metals and non-metallic materials. The major economic driving force for recycling of waste PCBs is the value of their metallic fractions (MFs) while recycling non-metallic fractions (NMFs), which take up almost 70 wt % of waste PCBs, were neglected and treated by combustion or land filling in the past [1]. However, NMFs are considered to be polymer rich based materials (FR-2) and glass fiber reinforced epoxy resin (FR-4) which produces carbon rich non-metallic residue after pyrolysis process [2]. Therefore, this alternative secondary waste NMFs can be considered for replacing the conventional sources to produce activated carbon which helps in maintaining the much needed sustainability. This further largely helps in bringing down the environmental concerns caused through e-waste and also as an electrode material for several devices. Therefore, We have taken an initiative in recycling of NMFs from waste PCBs to use it as a resource in energy storage devices.

Keywords: E- waste, Waste PCBs, NMFs, Electrode Material

References:

[1] Ghosh B, Ghosh MK, Parhi P, Mukherjee PS, Mishra BK (2015) Waste printed circuit boards recycling: an extensive assessment of current status. J Clean Prod 94:5–199.

[2] R.R. Rajagopal, R. Rajarao, V. Sahajwalla, High temperature transformations of waste printed circuit boards from computer monitor and CPU: Characterisation of residues and kinetic studies, Waste Manage. (2016).

Biography of the Presenting Author: Anuj Thukral is working as a Research Scholar at CSIR-NPL

EMNSD 2020/PP/30

Advanced Electroactive Composites for corrosion protection of metals

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Abstract

With much of the world's population residing in the close propinquity to water and humidity, corrosion of metallic material is most ineluctable. Corrosion also has a stupendous effect on the economy and result in the financial losses. Earlier also different types of coatings were used to prevent corrosion, one of them was chromate coatings but due to its hazardous nature it is not in use. So, we will be thinking of designing the smart coatings having electrical conductivity, barrier properties, electroactivity that can be use under aggressive conditions (3% NaCl or 2.5 % HCl). Polyaniline (conducting polymer) and Graphene Oxide are the coating materials that have the above-mentioned characteristics properties can be used to protect the metal surface from corrosion. GO and polyaniline was prepared and characterised by the various spectroscopical techniques via XRD, FTIR, UV-Visible, FESEM. Also, the composite of the GO and the polyaniline was prepared by the chemical approach and the contribution of both was confirmed by comparing the Characterisation data with GO and polyaniline.

References:

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2. B. Wessling, "Passivation of metals by coating with polyaniline: corrosion potential shift and morphological changes," Advanced Materials, vol. 6, no. 3, pp. 226–228.

Biography of the Presenting Author:

Neha is a Ph.D. scholar at CSIR- National Physical Laboratory . She is working under the supervision of Dr. Parveen Saini.

EMNSD 2020/PP/31

Emergence of Nanographene: From Synthesis To Applications- A Review

Islam Mirjufa[1], Bhattacharjee Tuhin[1], and Majumdar Gitanjali[1]

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Abstract

Nanographene is an evolving member of nanocarbon family which is now a hot topic in the field of nanoscience. These are single-layer two-dimensional sp^2-hybridized carbon sheets with an adjustable bandgap. Nanographenes[1, 2] have a range of unusual physical, chemical and mechanical properties. Its unique feature is due to its unconventional nonbonding π-state localized around its edge. The chemistry of nanographene is as old as 1980s but its significance was not well recognized and the materials were referred to as thin graphite flakes. Both "top down" approach like lithographic cutting of graphene sheet, unzipping of carbon nanotubes "bottom up" approaches like unconventional carbon material from nanographene .In many sustainable processes such as removal of nitrogen, on-the fly capture of nitroatomic explosives[3], removal of organic pollutants[4] etc. Nanographene has been used for environmental remediation. Here we review extensively the recent research progress of nanographene, its synthesis and use in environmental remediation. The synthetic procedure starting with top down to bottom up for the production of nanographene will be discussed along with the extensive use of nanographene in environmental remediation and some medical applications.

References:

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2. Gholizadeh, A.; Babaei, A.; Ziaratban, M.; Haghjoo, Z.; Toprak, M. S. Facile synthesis of nanographene by a high-yield and scalable method. Ceramics International. **2020**. doi:10.1016/j.ceramint.2020.06.056.
3. Khezri, B.; Beladi Mousavi, S. M.; Sofer, Z.; Pumera, M. Recyclable nanographene-based micromachines for the on-the-fly capture of nitroaromatic explosives. Nanoscale. **2019**. doi:10.1039/c9nr02211b
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EMNSD 2020/PP/32

Recycling of waste Zinc-Carbon batteries

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[1]CSIR-National Physical Laboratory, New Delhi-110012, India

[2]Academy of scientific and innovative research (AcSIR), CSIR-NPL Campus.

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Abstract

The zinc-carbon battery is very popular portable electrical energy source. It is widely used as disposable energy resource due to low price, suitable cell voltage, good life and availability everywhere. This has led to huge waste volumes and associated waste management concerns. It is particularly, challenging to recycle them due to presence of elements which may adversely affect the human health and safety of environment. Every year large volume of waste batteries including Zinc-Carbon (Zn-C) battery ends up in landfill, without any treatment leading to severe land and water pollution. Therefore, the recycling mediated transformation of waste Zn-C battery back into energy or other application, is of great significance for sustainable strategies Therefore, with the active composition of carbon rod as positive terminal, zinc case as negative terminal, and mixture of carbon powder, ammonium chloride, and MnO_2 as electrolyte, Zn-c battery recycling provides opportunity to realize waste to wealth by recovery of these elements. We have adopted combination of mechanical, chemical and thermal treatment steps to recycle Zn-c battery and recovery various elements. The recovered materials were characterized and attempt has been made to use them for appropriate applications like EMI shielding, supercapacitors, water purification etc.

Keywords: Zn-carbon batteries, acid leaching, recycling, supercapacitor

References:

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Manmohan Singh Gautam, research scholar (SRF) at CSIR-National Physical laboratory. Working on Recycling of waste energy storage devices mainly Li-ion batteries and zinc carbon batteries. Recently presented paper on Li-ion recycling at ICPREM 2020 Hyderabad.

EMNSD 2020/PP/33

Iron Oxide Nanoparticles: Greener Synthesis Using Callistemon viminalis Plant Leaf Extract

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Abstract

We present a simple and eco-friendly process for the green synthesis of magnetic iron oxide (Fe_3O_4) nanoparticles using Callistemon viminalis leaf extract as reducing and capping agent. The aqueous solution of $FeCl_3$ and $FeCl_2.2H_2O$ has been exposed to aqueous leaf extract of Callistemon viminalis. Following the reduction of exposed compounds, iron magnetic nanoparticles having average size of 10 nm were obtained. The magnetic nanoparticles so obtained were characterized using UV-Visible spectroscopy, X-ray diffraction, quasi elastic light scattering and transmission electron microscopy. The study suggested a new and promising biosynthetic catalyst which shall be useful for the industrial synthesis of nanoparticles. The polyols and the heterocyclic components were believed to be responsible for the formation and stabilization of iron oxide magnetic nanoparticles, respectively.

Key Words: XRD, TEM, Biocatalyst, EDX

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[1] A. Bouafia and S. E. Laouini, "Green synthesis of iron oxide nanoparticles by aqueous leaves extract of Mentha Pulegium L.: Effect of ferric chloride concentration on the type of product," *Mater. Lett.*, vol. 265, p. 127364, 2020, doi: 10.1016/j.matlet.2020.127364.

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Biography of the Presenting Author:

Mrs. M. Hinuja holds MSc (Chemistry) degree and Currently she is pursuing Ph.D. (Chemistry) from BESTIU, Anantapur (Andhra Pradesh). She is an Assistant Professor in CMR Institute of Technology, Hyderabad (Telangana). She has over 13 years of teaching

EMNSD 2020/PP/34

Effect of Endophytic Fungus *Fusarium oxysporum* on Crystallographic Properties of PdO: Nanoparticles Synthesis, Characterization and Anti-oxidant Activity Evaluation

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Abstract

In recent times, semiconductor transition metal oxide nanoparticles have gained a lot of attention because of their unique physio-chemical properties which mainly depends on size, shape, crystallographic phase and synthesis routes. Palladium Oxide Nanoparticles (PdO NPs) belonging to the platinum group metal oxide possesses potential application in catalytic conversion of organic molecules and gas sensing application (1-3). Different methods have been reported for the synthesis and low pressure phase transition of PdO NPs (4-6). Herein we report a simple endophytic fungus *Fusarium oxysporum* assisted novel approach for the biofabrication of face centered cubic (FCC) PdO NPs from tetragonal PdO powder. The change in crystallographic properties under fungal stress was confirmed by XRD analysis while TEM images show biotransformed PdO NPs of average particles of size 6-8 nm. FTIR spectrum confirmed the presence of capping protein which made PdO NPs water dispersible with very high self-life. Anti-oxidant activity and optical band gap energy (1.8 eV) has also been estimated using UV-VIS-NIR spectrophotometer.

Keywords: Anti-oxidant activity, Crystallography phase transition, Endophytic, *Fusarium oxysporum*, PdO NPs.

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International Conference on

Evolving Materials and Nanotechnology for Sustainable Development

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Kokrajhar, BTR, Assam-783370, India.

PROGRAMME

DAY 1, 15 December 2020, TUESDAY

TIME	
9:30-1.00 PM (Day 1, 1st Session) Session Co-ordinator: Dr. Anamika Kalita Deka	
9.30-10.00AM	***INAUGURATION*** **Welcome Speech and Opening of e-Abstract Volume:** Prof. Debkumar Chakrabarti, Director, CITK **Welcome Speech:** Ms. Chiatali Bramha, Registrar, CITK **Convener Speech:** Dr. Manasi Buzar Baruah, Asstt. Professor, Dept. of Physics, CITK Photo Session
10.00-10.45AM	***KEYNOTE SPEAKER*** **Prof. Madan K Bhattacharyya** Department of Agronomy, Iowa State University, Ames, Iowa, USA **Title: Genetic modification of a soybean gene for enhancing broad-spectrum disease and pest resistance in soybean** **Department of Agronomy, Iowa State University, Ames, Iowa, USA**
10.45-11:15AM	***INVITED SPEAKER*** **Prof. Hiranya K Nath** Department of Economics International Business, Sam Houston University, Texas, USA **Title: Information and Communications Technology (ICT) and Economy**
11:30-12.00 NOON	***INVITED SPEAKER*** **Dr. Indrani Banerjee** **Associate Professor and Dean, School of Nano Sciences, Central University of Gujarat, Gandhinagar, Gujarat, India** **Title: Structure Function Relation of Microwave Synthesized Muga Silk Nanoparticles**

	ORAL PRESENTATION **(Day 1, 1st Session)** **Chairman: Dr. Indrani Banerjee** **Associate Professor and Dean, School of Nano Sciences,** **Central University of Gujarat, Gandhinagar, Gujarat, India**
OP1 **12.00-12.10PM**	Challenge and Success In Synthesis Of Quadruple Perovskites At Ambient Condition Ariful Haque Department of Chemistry, Visva-Bharati university, Santiniketan, Pin – 731235, India
OP27 **12.10-12.20PM**	Optical and Electrical Properties of CuO Nanoparticles Synthesized Using Citrus Maxima Peels Sanjib Baglari Department of Physics, Birjhora Mahavidyalaya, Bongaigaon, Assam:783380, India
OP3 **12.20-12.30PM**	Waste Sesamum indicum Plant: An Efficient Heterogeneous Catalyst for Biodiesel Production Sanjay Basumatary Department of Chemistry, Bodoland University, Kokrajhar-783370, Assam, India
OP4 **12.30-12.40PM**	All-optical Binary to Quaternary Radix Converter using SOA-PRS Ashif Raja COSOD, Department of Physics, Kazi Nazrul University, Asansol-713340, West Bengal, India
OP5 **12.40-12.50PM**	A study on Iron Oxide (γ- Fe_2O_3) Nanoparticles synthesised using precipitation method and its possible applications Bandana Gogoi Department of Physics, D.N.Govt College, Itanagar-791113, Arunachal Pradesh, India
OP6 **12.50-1.00PM**	Plasmon Resonances in Interacting Ni Nanoparticles Embedded in Dielectric Jayanta Kumar Majhi Post Graduate Department of Physics, Banowarilal Bhalotia College, Asansol – 713303, West Bengal
1.00-2.00 PM	**LUNCH BREAK:**

	POSTER SESSION: 2.00-3.30PM **Group 1: PP1-PP17: Google Meet Link: https://meet.google.com/giw-ncsv-okg** **Group 2: PP18-34: Google Meet Link: https://meet.google.com/cpb-trxe-cft**
	(Day1, Session 2, 3.30-6.00 PM) **Co-ordinator: Dr. Sahalad Borgoyary & Mr. Bikramjit Choudhury**
3.30-4.00PM	***INVITED SPEAKER*** **Dr. Chris Holland** **Senior Lecturer** **Department of Material Science & Engineering** **The University of Sheffield, S. Yorks, UK** **Title: Sustainable Polymer Processing Inspired by Silk**
	ORAL PRESENTATION **Chairman: Dr. Chris Holland** **Senior Lecturer** **Department of Material Science & Engineering,** **The University of Sheffield, S. Yorks, UK**
OP7 **4.00-4.10PM**	Biocompatible Nanocarrier For Effective Delivery Of Antimicrobial To Agricultural Crop Gunjan Harshadkumar Vyas School of Nano Sciences, Central University of Gujarat, Gandhinagar, India.
OP8 **4.10-4.20PM**	Preparation of carotenoid Loaded BSA Nanoparticle Stabilized by Biosurfactant Jyoti Jaiswal School of Nano Sciences, Central University of Gujarat, Gandhinagar 382030, India.
OP9 **4.200-4.30PM**	Microstructure and Abnormal Coalescence Behavior of Ion Beam Sputter Deposited Silver and Gold Thin Films Rajeeb Brahma Department of Physics, Bodoland University, Kokrajhar, BTAD, Assam – 783370, India.

OP12 **4.30-4.40PM**	Study on Electrical Characteristics of Normally On Junctionless Field Effect Transistor Angshumala Talukdar Department of Instrumentation Engineering Central Institute of Technology Kokrajhar, Kokrajhar, India.
OP16 **4.40-4.50PM**	Investigation of the Spin Speed Variation on the Performance of PEDOT:PSS/Si Hybrid Solar Cells Avritti Srivastava CSIR-National Physical Laboratory, New Delhi-110012, India
OP25 **4.50-5.00PM**	Application of Musa paradisiaca derived ashes as heterogeneous base catalyst for Cross-Aldol reactions at room temperature Dulu Brahma Department of Chemistry, Central Institute of Technology Kokrajhar (Deemed to be University, MHRD, Govt. of India), Kokrajhar-783370, Assam, India.
5.00-5.30PM	***INVITED SPEAKER*** **Dr. Bharat Baruah** Department of Chemistry and Biochemistry, Kennesaw State University, GA, 30144, USA **Title: Fabrication of Flexible Transparent Wood Infiltrating Natural Polymer**

DAY 2, 16 December 2020, WEDNESDAY

10:00-1.00PM (Day 2, 1st Session) Co-ordinators: Mr. Mahananda Brahma & Mr. Sanjib Narzary; Mr. Bipin Brahma	
10:00-10:45AM	**KEYNOTE SPEAKER** **Prof. Absar Ahmed** Director, Interdisciplinary Nanotechnology Centre (INC), Aligarh Muslim University, Aligargh, Uttar Pradesh, India. **Title: Green Fabrication of Nanomaterials, and their applications in healthcare, agriculture, environment, energy and life sciences**
10:45-11:15AM	**INVITED SPEAKER** **Dr. Pranjal Kalita** Associate professor, Department of Chemistry, CIT Kokrajhar, Assam, India **Title: Recovery of Waste into Value-Added Compounds**
	ORAL PRESENTATION (Day2, Session 1, 11.15AM-1.00PM) **Chairman: Dr. Pranjal Kalita** Associate Professor, Department of Chemistry, CIT Kokrajhar, Assam, India
OP10 **11:15-11:25AM**	Synthesis and Ultrasound-assisted Extraction of Polyhydroxybutyrate (PHB) from Invasive Weeds Sushobhan Pradhan School of Chemical Engineering, Oklahoma State University, Stillwater, Oklahoma, USA.
OP11 **11:25-11:35AM**	Biodiesel production from waste cooking oil using a novel heterogeneous catalyst based on calcium oxide nanoparticles Gaurav Singh St. Peter's Engineering College, Hyderabad, India.
OP13 **11:35-11:45AM**	Depletion Width Determination of Double gate Junctionless Field Effect Transistor With Triangle Shaped Spacer Anjanmani Baro Department of Instrumentation Engineering, Central Institute of Technology Kokrajhar, Kokrajhar, India

OP14 **11:45-11:55AM**	Tera-Hertz Optical Asymmetric Demultiplexer(TOAD) using quantum dot Semiconductor Optical Amplifier Kousik Mukherjee Physics Department, B B College, Asansol, West Bengal, India
OP15 **11:55-12:05PM**	Effect of Annealing Temperature on the Structural and Optical Properties of ZnO Nanoparticles Synthesised by Colloidal Route Premshila Kumari CSIR-National Physical Laboratory (NPL), New Delhi-12, India
OP22 **12:05-12:15PM**	Design of a Power Inverter Using Solar Cell As A Source Of Charger HEMEN CH MEDHI Department of Electronics, St. Edmund's College, Shillong-793003, India
OP17 **12:15-12:25PM**	Hydrogen Adsorption on $TMMg_3$(TM=Ni, Pd, Pt) Clusters: First Principles Study Bishwajit Boruah Department of Physics, Dibrugarh University, Dibrugarh, Assam, India-786004
OP18 **12:25-12:35PM**	Effect of the Ligands PPIA and TOPO on the spectroscopic behaviour of Sm^{3+} ions in sol-gel silica matrix Navaneeta Rajkonwar Department of Physics, Dibrugarh University, Assam, India
OP19 **12:35-12:45PM**	Mg-doped ZnO Nanomaterial: An efficient sunlight driven photocatalyst Riu Riu Wary Department of Physics, Central Institute of Technology Kokrajhar (Deemed to be University, MHRD, Govt. of India), Assam.
OP20 **12:45-12:55PM**	Direct Synthesis of Co_3O_4 Nanomaterials by Carbonate Precursor Arnab Kanti Giri Department of Chemistry, Karim City College, Jamshedpur, Jharkhand, India.
1.00-2.00PM	**LUNCH BREAK**

	(Day2, Session 2, 2.30-5.00PM) Coordinators: Dr. Kaushik Chandra Dev Sarma & Bikramjeet Choudhury; Biswajit Paul and Nayanmani Barman
2.00-2.30PM	**INVITED SPEAKER** **Dr. Logudurai Radhakrsihnan** Associate Professor & Head, Department of Chemistry, Madanapalle Institute of Technology & Science, Madanapalle, Andrapradesh, India **Title: Electrochemical Investigation of Nano-porous Gold Electrodes in presence of Biofouling Solutions**
	ORAL PRESENTATION **Chairman: Dr. Logudurai Radhakrsihnan** Associate Professor & Head, Department of Chemistry, Madanapalle Institute of Technology & Science, Madanapalle, Andrapradesh, India
OP21 2.30P-2.40PM	Orientational Order, Optical and Dielectric Properties of Liquid Crystals containing Bicyclohexane Rigid Core S. Mondal Department of Electronics and Communication Engineering, Siliguri Institute of Technology, Siliguri-734 009, India.
OP23 2.40P-2.50PM	Comparision of Polyvinyl Alcohol Capped Chemically Synthesized CdS and CdZnS Nanostructured Films Prince Kumar Mochahari Department of Physics, Bodoland University, Kokrajhar, India
OP24 2.50P-3.00PM	Application of Nanofluids for heat transfer processes Monisha Mridha Mandal University School of Chemical Technology, Guru Gobind Singh Indraprastha University, New Delhi
OP26 3.00P-3.10PM	Structural Evaluation of Muga silk protein by experimental and computational approach Prithvi Asapur Central University of Gujarat, Ahmedabad, Gujarat, India

OP2 3.10P-3.20PM	Chromeno[2,3-b] indoles as ultra-high Stokes shift luminescent materials Basanta Kumar Rajbongshi Department of Chemistry, Cotton University, Panbazar, Guwahati – 781001, Assam, India.
OP28 3.20P-3.30PM	Nanoparticle analysis using Digital Image Processing Minakshi Gogoi Dept. Of CSE, Girijananda Chowdhury Institute of Management and Technology, Guwahati-17, Assam, India
OP29 3.30P-3.40PM	TL Dating of Potsherds from Tumu Ching, Manipur, India Sheikh, M.R Lilong Haoreibi College, Manipur, India.
OP30 3.40P-3.50PM	Design And Simulation Of Non-metallic And Flexible Broadband Metamaterial Absorber For X-band Applications Dipangkar Borah Department of Physics, B. N. College, Dhubri, Assam, India.
4.00-Onwards	**Valedictory** **Vote of Thanks**

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Tuesday, Dec 15, 2020 8:00 am | 12 hours | (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi

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Wednesday, Dec 16, 2020 8:00 am | 12 hours | (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi

Meeting number: 176 003 8282

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About the Conference,

Evolving materials especially synthesis of the green materials bring tremendous changes in the line of sustainable development. Nanotechnology has the diverse applications in areas of energy, drug delivery, biotechnology, foodtechnology, devices, and many others, and the benefit goes to the entire society directly. For this reason, the investment of evolving materials towards nanotechnology has been increasing day by day worldwide in Research and Development sectors. Believe that such conference will encourage the collaborative exchange of thought in international level among faculty as well as research scholar so that can enjoy the global exposure to get the momentum for carrying their individual research work.

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Central Institute of Technology Kokrajhar (CITK) is a Deemed-to-be-University of de-novo category under the Ministry of Education of the Government of India, established in 2006. The Institute imparts education in engineering and design through its doctoral, postgraduate, undergraduate and diploma programs. Located in Kokrajhar in the Bodoland Territorial Region of Assam in the North Eastern part of India, the Institute is mandated to fuel all-round development of the region by providing requisite technological and vocational skill-based training, and to contribute to the country's economic growth.