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NANOMATERIALS MEETINGS 2017

DAY 1
SPECIAL SESSION

INTERNATIONAL MEETING ON

ADVANCED NANOMATERIALS AND NANOTECHNOLOGY

NOVEMBER 07-08, 2017 SINGAPORE

Meetings International

Wei Lei, Nano Res Appl 2017, 3:4
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INTERNATIONAL MEETING ON
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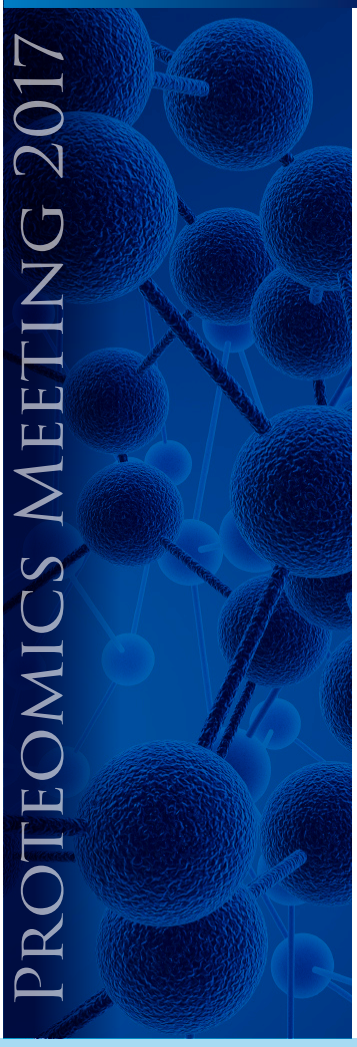
Wei Lei

Southeast University, China



Integration of quantum dots photo-sensor with quantum dots LED

Recently, the photo thin film transistor (TFT) with colloidal quantum dots (QD) has been investigated deeply. This type of photo-TFT has high responsivity, high detectivity and tunable detecting wavelengths. Quantum dots LED is also mentioned as a promising display with high efficiency, saturated color and low cost. Because both QD photo sensors and QD LEDs can be fabricated with solution process, an interactive device with QD photo-TFTs and QD LEDs is studied in this work. Because PbS QDs and Ge QDs show strong absorption in infra-red (IR) waveband, it is used as the active materials for IR sensor in this work. CdSe/ZnS quantum dot has extraordinary properties of light emission, so it is used as light emitters in the QD LED. To improve the performance of photo-TFT, the QDs are deposited on the active layer to increase the photoconductivity under illumination. For the QD LED device, the ETL, HTL and device structure are optimized to decrease the driving current. The structure of integrated devices is shown in Fig.1. Because the photo current is amplified by TFT, the responsibility of QD photo-sensor is about 10^4 A/W. For the QD LED developed in this paper, the power efficiency is about 30 lm/W for green light. The peak brightness of green light is as high as 10,060 cd/m^2.

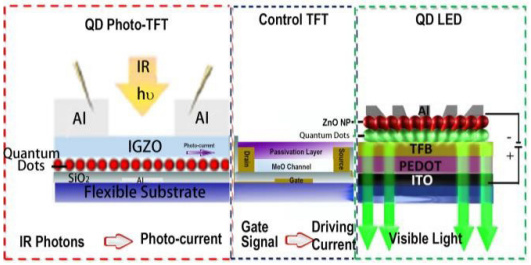


Figure-1: QD photo-TFT is integrated with QD LED.

Recent Publications

1. Q Q Huang, J Y Pan, Y N Zhang, J Chen, Z Tao, C He, K F Zhou, Y Tu and W Lei (2016) High-performance quantum dot light- emitting diodes with hybrid hole transport layer via doping engineering. Opt. Express; 24: 25955.
2. J Y Pan, J Chen, D W Zhao, Q Q Huang, Q Khan, X Liu, Z Tao, Z C Zhang and W Lei (2016) Surface plasmon-enhanced quantum dot light emitting diodes by incorporating gold nanoparticles. Opt. Express; 24: A33.

Biography

Wei Lei is a Professor in the Department of Electronic Engineering in Southeast University, China. He was engaged in project cooperation between Southeast University and Philips Company. He had designed a few new electron guns for cathode ray tubes and he has also investigated the method to improve the sensitivity of deflection coil. His research fields cover the nanomaterials for photonic detectors, field effect transistor based on nanowires, 3D display technologies and micro-displays. He has published more than 150 hundred papers in the scientific journals and has got 28 patents.

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Elias E Elemike et al., Nano Res Appl 2017, 3:4
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Facile synthesis of Ag and Ag-CuO nanoparticles using aqueous extracts of *Mimosa pigra* and their catalytic activities in the degradation of some common pollutants

Elias E Elemike, Damian C Onwudiwe, Doris F Ogeleka and Justina I Mbonu
North West University, South Africa

Biosynthesis of Ag and Ag-CuO nanoparticles using aqueous leaf extracts of *Mimosa pigra* is presented. The nanoparticles were synthesized using different concentration ratios of aqueous leaf extract of *Mimosa pigra* to the silver and copper salts. The nanoparticles were characterized using UV-vis spectroscopy, Fourier transform infra-red (FTIR) spectroscopy, powder X-ray diffraction (PXRD), scanning and transmission electron microscopies. Stable nanoparticles with average particle size of 17.5 nm (Ag) and 49.5 nm (Ag-CuO), which were capped by the plant extracts via the O-H and C=O groups from flavonoids, tannins and other bio compounds were obtained. The UV-vis spectra revealed earlier formation of surface Plasmon bands for silver nanoparticles when the volume of extract was reduced, although with lower intensity. In the spectrum of Ag-CuO nanoparticles, broad bands around 400-500 nm appeared in the region of 365-369 nm. Crystallite size of approximately 50 nm for the Ag-CuO was calculated from XRD results using Scherrer equation and the particles were well dispersed as shown by the TEM images. The photocatalytic activities of the synthesized Ag and Ag-CuO nanoparticles were studied towards the degradation of methylene blue (MB) and hydrogen peroxide (H^2O^2). The results provide eco-friendly reaction toward environmental remediation from common pollutants.

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Sabu Thomas, Nano Res Appl 2017, 3:4
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Engineering at the nanoscale: A strategy for developing high performance functional materials

Sabu Thomas
Indian Institute of Technology Kharagpur, India

The talk will concentrate on various approaches being used to engineer materials at the nanoscale for various applications in future technologies. In particular, the case of clay, carbon nanostructures (e.g., nanotubes, graphene), metal oxides, bio-nanomaterials (cellulose, starch and chitin) will be used to highlight the challenges and progress. Several polymer systems will be considered such as rubbers, thermoplastics, thermosets and their blends for the fabrication of functional polymer nanocomposites. The interfacial activity of nanomaterials in compatibilizing binary polymer blends will also be discussed. Various self-assembled architectures of hybrid nanostructures can be made using relatively simple processes. Some of these structures offer excellent opportunity to probe novel nanoscale behavior and can impart unusual macroscopic end properties. I will talk about various applications of these materials, taking into account their multifunctional properties. Some of the promising applications of clay, metal oxides, nanocellulose, chitin, carbon nanomaterials and their hybrids will be reviewed. Finally the effect of de-wetting up on solvent rinsing on nanoscale thin films will also be discussed.

Recent Publications

C K Radhakrishnan, A Sujith, G Unnikrishnan, S Thomas (2004) Effects of blend ratio and crosslinking systems on the curing behavior, Morphology and mechanical properties of styrene butadiene rubber/Poly (ethylene-co-vinyl acetate blends. J. Appl. Polym. Sci.; 94: 827.

R Thomas, J Abraham, T P Selvin, S Thomas (2004) Influence of carboxyl-terminated (butadiene-co-acrylonitrile) loading on the mechanical and thermal properties of cured epoxy blends. J. Polym. Sci. Part B: Polym. Phys; 42: 2531.

Biography

Sabu Thomas is the Director of the International and Interuniversity Centre for Nanoscience and Nanotechnology and Full Professor of Polymer Science and Engineering at the School of Chemical Sciences of Mahatma Gandhi University, India. He is an outstanding leader with sustained international acclaims for his work in polymer science and engineering, polymer nanocomposites, elastomers, polymer blends, interpenetrating polymer networks, polymer membranes, green composites and nanocomposites, nanomedicine and green nanotechnology.

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Danmaigoro Abubakar et al., Nano Res Appl 2017, 3:4
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pH-responsive Doxorubicin-loaded cockle shell-derived nanoparticles: Release kinetics and pharmacokinetics in canine

Danmaigoro Abubakar, Gayathri, Thevi Selvarajah, Moh'd, Hezmee, Moh'd Noor, Rozi Mahmud and Md Zuki Abu Bakar
Universiti Putra Malaysia, Malaysia

Nanoparticles with stimuli-responsive release mechanism have received great interest in nanomedicine. Doxorubicin-loaded pH-responsive nanocarriers could enable selectivity and specificity by reducing premature drug release in the plasma following an intravenous administration. Doxorubicin-load cockleshell-derived nanoparticle (CSNP-DOX) was prepared via ball-milling method. Apart from the analysis of CSNP drug release kinetics at pH 4.8 and 7.4, a high-performance liquid chromatography (HPLC) bioanalytical method was developed for the detection of doxorubicin. For the pharmacokinetics of CSNP-DOX, Animal ethics approval was sought. Six canines were divided into two groups to receive intravenous CSNP-DOX and free doxorubicin at 30 mg/m^2, respectively. At pre-determined time interval, blood was sampled and processed before analyzed by HPLC. The pharmacokinetic parameters were determined based on the plasma doxorubicin concentration in the canines. An excellent bioanalytical method with high acceptable extraction yield and linearity of 89.87% and 0.997 within the range limit of 0.25-4 µg/mL was revealed from the method developed. At pH 7.4, 13.7% of DOX was released from CSNP-DOX after 96 hours while 52.6% of doxorubicin was recorded in the free doxorubicin alone. However, the amount of doxorubicin released from the nanocarriers doubled in acidic condition. CSNP-DOX increases the $t^{1/2}$, T_{max} and AUC_{0-t} of doxorubicin. The plasma concentration of doxorubicin rapidly becomes lower versus time when compared to the plasma concentration of CSNP-DOX. CSNP-DOX exhibited pH-triggered and sustained-drug release properties. The pharmacokinetic parameters confirmed that CSNP has the ability to regulate and delay the release of doxorubicin in blood circulation.

Biography

Danmaigoro Abubkar is currently a PhD student at Universiti Putra Malaysia. He is also a Lecturer at the Usmanu Danfodiyo University, Nigeria at the Department of Veterinary Anatomy.

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Omolola Esther Fayemi et al., Nano Res Appl 2017, 3:4
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Electrochemical properties of nanoporous based materials doped with metal oxide nanoparticles for potential application as sensors

Omolola Esther Fayemi and Eno E Ebenso
North-West University, South Africa

Nanotechnology is playing an increasing important role in the development of nanosensors. Recently, electrochemical biosensors based on nanostructured metal oxides gained much attention in the field of health care for the management of various important analyte in a biological system. The unique properties of nanostructured metal oxides offer excellent prospects for interfacing biological recognition events with electronic signal transduction and for designing a new generation of bioelectronics devices. The purpose of the study is to evaluate the sensing properties of different nanoporous based materials doped with different metal oxide nanoparticles towards the electrochemical detection of various biological and environmental molecules and how such devices have enabled the achievement of high sensitivity and selectivity with low detection limits. Conclusion and the significance of the study produced an observation that the sensitivity and performance of nanostructured metal oxide based sensors is improved in the presence of these materials. The use of these metal oxide nanostructured materials has allowed the introduction of many new signal transduction technologies in biosensors.

Recent Publications

Tebogo P Tselea, Abolanle S Adekunle, Omolola E Fayemi, Eno E Ebenso (2017) Electrochemical detection of Epinephrine using Polyaniline nanocomposite films doped with TiO2 and RuO2 Nanoparticles on Multi-walled Carbon Nanotube. Electrochimica Acta; 243: 331-348.

Omolola E. Fayemi, Adeniyi S Ogunlaja, Pierre FM Kempgens, Edith Antunes, Nelson Torto, Tebello Nyokong, Zenixole R Tshentu (2013) Adsorption and separation of platinum and palladium by polyamine functionalized polystyrene-based beads and nanofibers. Minerals Engineering; 53: 256-265.

Biography

Omolola Esther Fayemi has her expertise in synthesis, characterization and application of nano-based materials as electrochemical sensors and wound dressing. She is very passionate about her work and aspires to develop novel materials that can be used as sensors to monitor the concentration of biological molecules in pharmaceutical samples, food and organo-chlorine pesticides for environmental pollution control.

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Seyed Rahman Djafari Petroudy et. al., Nano Res Appl 2017, 3:4
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Environmental friendly superabsorbent polymers (SAPs) based on cellulose nanofibers (CNFs)

Seyed Rahman Djafari Petroudy, Jalal Ranjbar and Esmaeil Rasooly Garmaroody
Shahid Beheshti University, Iran

The current study was aimed to use CNF as strength enhancer of two naturally superabsorbents (SAPs) i.e., Acrylic Acid (AA) and Carboxymethyl Cellulose (CMC) based SAPs. The results showed that increasing the CNF content may be resulted in decreasing the Swelling Capacity (SC) of the produced SAPs. The produced SAPs showed excellent swelling capacity in comparison to sodium polyacrylate based SAPs and due to biodegradable and non-toxic properties can be replaced with aforementioned SAPs. The Ionic Sensitivity (IS) of all produced SAPs was investigated and resulted in increased and decreased IS with increasing the CMC and CNF content respectively. Centrifuged swelling resulted sufficient strength of the SAPs based on AA during the water absorption due to increasing CNF addition. Additionally, the antibacterial test also studied and the results showed that SAPs based on AA containing chitosan had bactericidal property against *Escherichia coli* whereas CMC based SAPs exhibited no antibacterial property versus aforesaid bacteria

Biography

Seyed Rahman Djafari Petroudy has been working as an Assistant Professor at the SBU University in Iran. He has published many interesting papers in well-known journals such as *Carbohydate Polymers, Cellulose* and *Journal of Polymer and the Environment*.

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Rupali Nagar et al., Nano Res Appl 2017, 3:4
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A simplistic two-step route to synthesize titanium dioxide structures and their application as humidity and ethanol vapor sensors

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[2]Savitribai Phule Pune University, India

Titanium dioxide (TiO_2) structures have been extensively used among metal oxide semiconductors owing to their comprehensive industrial applications as gas sensor, humidity sensor, solar cells, photocatalyst and laser diodes. Here, a low cost and simplistic process of synthesizing TiO_2 structures by sol-gel method is reported. The as-synthesized structures were tested for humidity sensing properties in bulk as well as thin film form for relative humidity (Rh) levels ranging from 8% to 90%. Doctor-blade technique was employed to make the film sensor while a pellet of 8 mm diameter was used as the bulk sensor reference. The sensors showed a quality response at low Rh values at room temperature; a condition required for an ideal sensor. The stability of the bulk and film sensors was tested over five cycles and the response observed was stable as well as reproducible. While the change in resistance for bulk sensor was observed to be in the range of 10^3 to 10^6 Ω, it ranged from 10^8 to 10^{11} Ω in the case of film sensor. Experiments on ethanol vapor sensing in the range from 0-400 ppm (parts per million) have shown that the sensors are selective towards ethanol vapors and have exhibited good response at higher concentrations (~300 ppm) in thin film form without showing any saturation. X-ray diffraction studies, scanning electron microscopy, ultraviolet-visible spectroscopy have been employed to investigate the structural, morphological and optical properties of the synthesized samples. It is observed that the as-synthesized samples have anatase phase, no distinct morphology and a band-gap of 3.3 eV. Both the pellets as well as film sensor demonstrate the sensing behavior at room temperature and ambient pressure. Further, the sensors have not been heated between cycles, which show that the sensor's capacity to adsorb and absorb the test gas/vapor is good and therefore the sensor is recyclable.

Recent Publications

Nagar R and Vinayan B P (2017) Chapter 5-Metal-semiconductor core–shell nanomaterials for energy applications A2-Gupta, Raju Kumar, in Metal Semiconductor Core-Shell Nanostructures for Energy and Environmental Applications. Elsevier; 99-132.

Vinayan B P, Nagar R and Ramaprabhu S (2016) Investigating the role of carbon support in catalytic activity of bimetallic Pt-Au nanoparticles for PEMFC application. Materials Research Express; 3: 095017-1-12.

Biography

Rupali Nagar is working at Symbiosis Institute of Technology, Pune, India as an Assistant Professor in the Department of Applied Science. She has completed her PhD from Indian Institute of Technology Delhi (IIT) and continued her research while working at Indian Institute of Technology Madras (IIT) as Project Officer till 2012. Her research interests include studying nanomaterials for energy and gas sensing applications.

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Kang-Yu Liu et al., Nano Res Appl 2017, 3:4
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Enhanced thermal stability and electrical characteristics of sputtered Pt thin film for low temperature solid oxide fuel cells

Kang-Yu Liu and Pei-Chen Su
Nanyang Technological University, Singapore

This work demonstrates a thermal stable nanoporous cathode with atomic layer deposited ZrO_2 capping and Pt-Ni alloying to effectively inhibit the thermal agglomeration of nanoporous Pt. The ZrO_2 capping is found to confine the surface nanoporous morphology and Pt alloying with Ni is found to constrain its underlaying microstructure at high temperature operation of 450 °C. The output current using ZrO_2 capped PtNi cathode has a significant improved stability, comparing with pure Pt cathode. The material characterization and electrical impedance spectrum were discussed towards the enhanced thermal stability and electrochemical behaviors.

Recent Publications

K Y Liu, Y J Yoon, S H Lee and P C Su (2017) Sputtered Nanoporous PtNi Thin Film Cathodes with Improved Thermal Stability for Low Temperature Solid Oxide Fuel Cells. Electrochimica Acta; 247: 558-563.

J D Baek, K Y Liu and P C Su (2017) A functional micro-solid oxide fuel cell with a 10 nm-thick freestanding electrolyte. Journal of Materials Chemistry A; 5: 18414.

Biography

Kang-Yu Liu has received both the Bachelor and Master degrees in School of Material Engineering from National Chung Hsing University, Taiwan in 2004 and 2006 respectively. From 2007 to 2012, he has served as a Research Engineer at Fuel Cell Department, Corporate R&D Center, Delta Electronic, Inc., where he focused on the development of polymer-based fuel cells. He is currently pursuing his PhD degree under the supervision of Assistant Professor Su Pei-Chen at School of Mechanical and Aerospace Engineering, Nanyang Technological University. His main research interests focus on fuel cell & energy conversion Technology

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Ajay Saini et al., Nano Res Appl 2017, 3:4
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Nano-fabrication of metal/heterometal oxides nanostructures using sol-gel process

Ajay Saini, Veena Dhayal and Dinesh C Agarwal
Manipal University, India

Metal/heterometal oxides nanostructures play an important role in materials science applications. Several applications such as photo- catalysis, in waste water treatment, lithium ion batteries, microelectronic circuits, solar cells, as sensors, as piezoelectric devices have been reported in literature. Earlier approach to synthesis was through solid state chemistry route, but in the recent years alternate approach using solution techniques have emerged, including co- precipitation, sol-gel process, hydrothermal processing, and solvothermal methods for fabrication of oxides nanostructures. Among these, sol-gel is a versatile method for the growth of nanostructures, such as nanorods, nanowires, nanobelts and hierarchical nanostructures, due to its simplicity, easy handling process and capability to control over grain size. Metal alkoxides are commonly used precursors for the synthesis of oxides nanostructures. The modification in metal alkoxides i.e. substitution of alkoxo group by chelating ligands such as oximes, β-ketones, Schiff's base, glycerols, etc. changes electronic environment of the precursor, which affects the kinetics of hydrolysis as well as condensation reactions, leads to altered morphology and functionality of oxides nanostructures. The introduction of modifiers not only generates steric effects, but also increase the gelation time and maintained the viscosity of the sol. The present authors have experimented to modify the precursors of aluminum and titanium alkoxides and also studied the effect of precursor chemistry on the morphology and size of the nanostructured metal/heterometal oxides by sol-gel technique. The paper presents the approach to modify the precursors of aluminum and titanium alkoxides, leading to modified nanoparticles with altered morphology. The nanostructures so obtained were found to possess better anti- scratch and anti-corrosive properties, making them an attractive possibility for surface protective coatings.

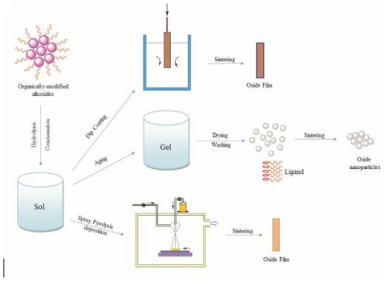

Figure-1: Schematic oxide nanostructures fabrication using Sol-Gel Process.

Recent Publications

1. Saini A, Jat S K, Shekhawat D S, Kumar A, Dhayal V and Agarwal D C (2017) Oxime-modified aluminium (III) alkoxides: Potential precursors for γ-alumina nano-powders and optically transparent alumina film. Materials Research Bulletin; 93: 373-380.
2. Atal M K, Saini A, Jat S K, Rathore K S, Dhayal V (2017) Synthesis and characterization of oxime-modified phynylimido vanadium (V) isopropoxide and their hydrolytic study. Journal of Sol-Gel Science and Technology; 83: 281-290.

Biography

Ajay Saini is pursuing his PhD in nano-fabrication of oxides nanostructures and their application. He is a qualified professional, engaged in hands-on R&D work in industry as well as in the academic research projects. He has expertise in the synthesis, design and characterization of materials (organic moieties and nanomaterials) using various spectroscopic techniques. He has published 4 research papers in international journals of high repute and presented 5 research papers in national and international conferences.

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Mechanical and thermal characteristics of solvent blended EPDM/neoprene clay nanocomposites: A comparative study

S Ginil Mon
Nesamony Memorial Christian College, India

Nanocomposites have definite advantages over conventional composites due to their light weight, low cost and excellent mechanical, thermal, optical and electrical properties. Clays and layered silicates are well suited for this purpose as they provide polymer-clay nanocomposites (PCNs) and polymer-layered silicate nanocomposites (PLSNs). Elastomers and rubbers are very promising polymeric matrices for the preparation of PCNs because of their multi-characteristic applications. Non-polar EPDM demands polar inducement in the form of compatibilizing agents for getting a homogeneous blend with neoprene. EPDM/neoprene matrices are prepared by solvent blending without any compatibilizing agents. Morphological studies and single Tg values have established an excellent compatibility of the blend, further confirmed by their enhanced mechanical characteristics. Organo-modified MMT Clay (CA-MMT) and locally available Kaolinite have been filled in the EPDM/Neoprene matrices to prepare their respective nanocomposites. The CA-MMT is adjudged as the most efficient filler as shown by the comparative studies, even though kaolinite too has shown comparable characteristics in a few cases. It is suggested that kaolinite could be a promising filler to be modified further to attain still better results.

Biography

S Ginil Mon is a Chemist who has specialized in polymer chemistry and has received his Doctorate from the Manonmaniam Sundaranar University, India. He has 6 publications to his credit. He is working in nanotechnology, polymer nanocomposites, spectroscopy and molecular docking as an international Resource Person. Currently he is teaching in the Department of Chemistry and Research, Nesamony Memorial Christian College, India.

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Debjyoti Paul, Nano Res Appl 2017, 3:4
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Therapeutic natural lipid nano-formulation rectifies molecular parameters of critical-inflammation pathogenesis.

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Division of Molecular Medicine, Bose Institute, India

Background: Nano-formulating natural biomolecules, including naturally occurring polyunsaturated fatty acid rich systems with proven therapeutic benefits, are being viewed as elegant solutions for unlocking the untapped potential of such molecules for translational research against critical disease pathogenesis. However, despite preliminary and at best theoretical promises, empirical evidences to establish the higher bio-functionality of therapeutic lipids as nano-templates are starkly lacking. In this context, this work presents encouraging real-time findings against both *in vivo* and *ex vivo* inflammation models for a therapeutic lipid, alpha-eleostearic acid (ESA), encapsulated in a novel and thoroughly characterized bio-compatible nano-emulsion (NE) system (particle sizes less than 200 nm).

Methods: A protocol involving high pressure homogenizer was developed to fabricate novel formulations of ESA and was characterized with standardized methods of DLS and TEM. Molecular biological tools and assays were employed to arrive at a definite conclusion.

Results: Among the treated experimental groups, the pro-inflammatory profile was found to be significantly mitigated in the hypersensitized rats administered with 0.25% ESA-NE formulation. ESA NE also restored the cell cycle phases of splenocytes to normal conditions and in a more emphatic manner as compared to ESA CE. The short-term effect of the formulations in the isolated human PBMCs challenged with and without lipopolysaccharide (LPS) for cell-surface bio-marker (CD 14, CCR5/CD195) expressions, also revealed novel findings.

Conclusion: The novel ESA NE formulation shows lot of palpable promise for clinical applications against pathogenic and delayed type-hypersensitivity.

Biography

Debjyoti Paul, is presently a post-doc in the laboratory of Sr. Professor Parimal Chandra Sen, Molecular Medicine division of the Bose Institute, Centenary Campus, located in Kolkata. Dr. Paul did his PhD. from the University of Calcutta in nano-formulations of therapeutic conjugated linolenic acid isomer, and has provided one of the earliest evidences of such lipids as nano-systems in ameliorating bio-molecular parameters against, diabetes, pathogenic mitogens and allergens. He has also been a pioneer in putting forward a stable formulation system to emulsify such PUFAs for clinical applications that can be nano-sized without leading to the formation of undesirable lipid-artifacts. His present focus is in developing nano-carriers to deliver novel drugs against mi-RNAs associated with Triple Negative Breast Cancer Cells.

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Zakaria Fouad Fawzy Hassan et al., Nano Res Appl 2017, 3:4
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Overview of nanotechnology applications with focusing about agricultural sector

Zakaria Fouad Fawzy Hassan and Shaymaa I Shedeed
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Attempts to apply nanotechnology in agriculture began with the growing realization that conventional farming technologies would neither be able to increase productivity any further nor restore ecosystems damaged by existing technologies back to their pristine state; in particular because the long-term effects of farming with "miracle seeds", in conjunction with irrigation, fertilizers, and pesticides, have been questioned both at the scientific and policy levels, and must be gradually phased out. Nanotechnology in agriculture has gained momentum in the last decade with an abundance of public funding, but the pace of development is modest, even though many disciplines come under the umbrella of agriculture. Specifically in agriculture, technical innovation is of importance with regard to addressing global challenges such as population growth, climate change and the limited availability of important plant nutrients such as phosphorus and potassium. Nanotechnology applied to agricultural production could play a fundamental role for this purpose and research on agricultural applications is ongoing for largely a decade by now. This also touches on the issue of nanotechnology in developing countries. Despite these potential advantages, the agricultural sector is still comparably marginal and has not yet made it to the market to any larger extent in comparison with other sectors of nanotechnology application. Nanotechnology devices and tools, like nanocapsules, nanoparticles and even viral capsids, are examples of uses for the detection and treatment of diseases, the enhancement of nutrients absorption by plants, the delivery of active ingredients to specific sites and water treatment processes. The use of target-specific nanoparticles can reduce the damage to non-target plant tissues and the amount of chemicals released into the environment. Nanotechnology derived devices are also explored in the field of plant breeding and genetic transformation.

Recent Publications

El Bassiony A M, Z F Fawzy, G S Riad and A A Ghoname (2014) Mitigation of High Temperature Stress on Growth, Yield and Fruit Quality of Tomato Plants by Different Shading Level. Middle East Journal of Applied Sciences; 4(4): 1034-1040.

Li Yunsheng , El-Bassiony A M, El-Awadi M E, Fawzy Z F (2015) Effect of Foliar Spray of Asparagine on Growth, Yield and Quality of Two Snap Bean Varieties. Agricultural and Biological Sciences Journal; 1(3): 88-94.

Fawzy Z F, El- Bassiony A M, Neama M Marzouk and M F Zaki (2016) Comparison of nitrogen fertilizer sources and rates on growth and productivity of squash plants. International Journal of PharmTech Research; 9(8): 51-57.

Fawzy Z F, Shaymaa I Shedeed, Nagwa M K Hassan (2016) A Review of Organic Agricultural of Some Vegetables Crops. American Journal of Food Science and Health; 2(3): 25-31.

Gamal S Riad, Abdalla A Ghoname, Amira M Hegazi, Zakaria F Fawzy, Maged A El-Nemr (2017) Cultivation in Rice Straw and Other Natural Treatments as an Eco-Friendly Methyl Bromide Alternative in Head Lettuce Production. Gesunde Pflanzen; 69: 21-28.

Biography

Zakaria Fouad Fawzy Hassan is the Professor in the Agriculture and Biological Division, National Research Center since 2013. Also, he is Assessor in the Egyptian Accreditation Council. He is the Former President of the Youth Scientific Research Association. He has published five scientific books and more than 45 scientific research paper. He has contributed significantly to the expansion of knowledge of organic agriculture and climate changes issues through public lectures on scientific research centers and various Egyptian and Chinese universities.

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Promising features of Au nanoparticles on near-infrared photoluminescence from Si/SiGe other than LSPR

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Au nanoparticles (NPs) have attracted broad attentions thanks to their superior capability to modify the optical, the electrical and the thermal properties of the surrounding medium. All those unique features and various applications of Au NPs are mainly based on the strong interaction with resonant photons through localized surface Plasmon resonance (LSPR). A question naturally arises whether the Au NPs can also remarkably modulate the properties of the surrounding median under the off-resonant excitation. In this report, the Si/SiGe hetero-structures are grown on Si (001) substrates by molecular beam epitaxy (MBE). The Au NPs on the Si/SiGe hetero-structures are obtained by annealing an ion-sputtered Au thin film at 400 °C for 30 min in the vacuum. It is found that the PL from the Si and the SiGe is comprehensively modified by the Au NPs under the excitation without the surface Plasmon resonance. Moreover, the PL spectra sensitively depend on the size of the Au NPs, the excitation power and the thickness of Si between the Au NPs and the SiGe, as shown in Figure 1(a). A model is proposed in terms of the electrostatic effect of the naturally charged Au NPs due to the electron transferring through the nano-scale metal/semiconductor Schottky junction without an external bias and an external injection of carriers. It reveals that Au NPs can substantially modify the energy band structures, the distribution and the transition of carriers in the nano-scale region below the Au NPs. Our results demonstrate that the Au NPs on semiconductor can efficiently modulate the light-matter interaction from the fundamental aspect of the matter as well as the light. Such promising electrostatic effects of the metal NPs open an alternative door to design innovative optoelectronic, photo-electrochemical and photo-catalytic devices based on the strong light-matter interaction.

Recent Publications

Y Yin, Z Wang, S Wang, Y Bai, Z Jiang, Z Zhong (2017) Electrostatic effect of Au nanoparticles on near-infrared photoluminescence from Si/SiGe due to nanoscale metal/semiconductor contact. Nanotechnolgy; 28(15).

Biography

Zhenyang Zhong has completed his PhD from Institute of Physics, Chinese Academy of Sciences, Beijing, China and Postdoctoral studies from Johannes Kepler University, Linz, Austria and Max Planck Institute for Solid State Research, Stuttgart, German. He is the Professor in Department of Physics, Fudan University, China. He has published 39 papers in reputed journals and serving as an Editorial Board Member of Journal of Material Sciences & Engineering.

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