

Editor-In-Chief

Ejembi John Onah, D.Sc

Professor of Chemistry, Nanoscience and Nanotechnology

ISSN 1941-3475 (Online)

Copyright 2009-2012 Focus Nanotechnology Africa Inc. All rights reserved

Content

Editorial Review : 6 years of Journal Nanotechnology Progress International (JONPI)	3
---	---

6 years of Journal Nanotechnology Progress International (JONPI)

These 6 years have been so wonderful with a committed team of editors and authors. I cannot mention names, I am just using this opportunity to thank all of you for your dedication, I could n't have asked for something better. Here are some of works in form of abstracts over the years:

2014:

Ethanol sensing property of SnO₂ quantum dots embedded on PVP

Choudhury M,* Nath S S,¹ Bhattacharjee R ²

*Dept of Electronics& Communication, NIT Silchar, Silchar-10, Assam, India *Dept of Physics, Assam

University, Silchar-12, Assam, India

¹Central Instrumentation Lab, Assam University, Silchar

Silchar-12, Assam, India.

²Department of Physics, Assam University, Silchar

Silchar-12, Assam, India.

We prepare of SnO₂ quantum dots embedded in polyvinylpyrrolidone (PVP) matrix and report it's working as ethanol sensor. The samples have been prepared via quenching technique where bulk SnO₂ powder is sintered at very high temperature of 1000⁰C and then quenched into ice cold polyvinylpyrrolidone solution. The specimen have been characterized by using UV/VIS spectroscopy, X-ray diffraction study and high resolution transmission electron microscopy (HRTEM). These studies indicate the sizes of quantum dots to be within 10 nm. The prepared quantum dot samples have been examined for ethanol vapor sensing by exploring the variation of their resistance with time at different operating temperatures. It has been revealed that SnO₂ quantum dots can sense ethanol at low operating (200⁰ C) temperature with less response time & recovery time.

Keyword: Quantum dot, Sensor, acetone, polyvinylpyrrolidone, quenching.

Synthesis and evaluation of functionalized chitosan nanoparticles as antimicrobial agents

Porras-Gómez M¹, Vega-Baudrit J. R.

Laboratorio Nacional de Nanotecnología (LANOTEC), Centro Nacional de Nanotecnología (CeNAT). San José. Costa Rica.

Abstract

The aim of this study is to evaluate the bacteriostatic effect of functionalized chitosan nanoparticles with antioxidants from tropical fruit extracts. In their synthesis and characterization, variables are treated in order to obtain concentrations and other parameters, which show bacteriostatic effect on some species of pathogenic gram-negative ATCC bacterias *E.coli*, and *P. aeruginosa*, and gram-positives *S. Aureus*, and *E. faecalis*. The hypothesis of this study is that functionalized nanoparticles synthesized according to the ion gelation method using tripolyphosphate as cross-linking agent with modifying agents from tropical fruit extracts, rambutan (*Nephelium lappaceum*) and blackberry (*Rubus glaucus*), containing antioxidants; gallic acid, giving chitosan nanoparticles the ability to inhibit bacterial growth. This research evaluated the polyphenol content and antimicrobial activity in conjunction with the nanoparticles against the pathogens mentioned above. Laboratory assays show concentrations between 90 and 200 mg of gallic acid/100g and antimicrobial activity in the gram-positive *S. aureus* and *E. faecalis*, and in the gram-negative *P. aeruginosa* and *E. coli*; determined by the disc diffusion method showing an inhibition diameter between 9 mm and 18 mm. These results show the potential of these nanoproductions as potential antimicrobial agents for use in the pharmaceutical industry.

Keywords: Nanoparticle, chitosan, bacteriostatic, natural polyphenols, antimicrobial agents.

2013

Are CNFs a Viable Option to Replace CNTs in High-Performance Nanocomposites? A Realistic Assessment

Inbaraj S. R. *, Nisha C.K., Mahajan Y.R.

Centre for Knowledge Management of Nanoscience & Technology,

Secunderabad-500 017, A.P., India

*Corresponding author:

Despite the significant potential of carbon nanotube (CNT) based nanocomposites, the realistic assessment shows that they fall far short of expectations in terms of their mechanical properties due to the difficulties involved in the processing. Furthermore, the high cost and toxicity issues have hampered the development of such 'super composites' for practical applications. The present article discusses the possibilities of using another cheaper alternative, carbon nanofibers (CNFs), for the cost effective manufacture of nanocomposites.

Keywords: Carbon nanofiber, carbon nanotube, nanocomposites

SnO₂ quantum dots for Second Harmonic Generation

Roy A., Nath S.S. ^{*#}

Department of Physics, [#] Central Instrumentation Laboratory, Assam University, Silchar.
Assam, India.

*Corresponding author

Abstract

We report the preparation, characterization and second harmonic generation in SnO₂ quantum dots. For preparation of SnO₂ quantum dots, the simple, cost effective chemical method has been adopted. After synthesis, the samples have been characterized by UV/VIS absorption spectroscopy and Transmission Electron Microscopy. These studies infer the SnO₂ particle size to be within 10 nm. Further, SnO₂ specimen has been tested for second harmonic generation. For that, SnO₂ samples have been illuminated with Nd: YAG laser beam of 700 nm of wavelength and the optical output is detected at a wavelength of 350 nm. This shows that SnO₂ quantum dots can be used for the purpose of second harmonic generation.

Keywords: Non-linear optical phenomena, Quantum Dots, Second Harmonic Generation

Green Nanotechnology
Photodynamic therapy: An Economic and Ecofriendly way for cancer treatment

Yadav R. ^{1*}, Yadav P. ², Yadav S. ², Saran D. ³
Agarwal A. ²

¹ Department of Biotechnology, R.B.S. College, Agra, India

² Department of Chemistry, Faculty of Eng. & Tech., Agra College, Agra., India

³ Department of Physics, Institute of Basic Science, Agra, India

*Corresponding author

Abstract

Green nanotechnology offers the ability to treat diseases in economical as well as in ecofriendly way, such as cancer. Conventionally, the most common cancer treatments were limited to chemotherapy, radiation, and surgery but these anticancer treatments, may induce severe systemic toxicity, and produce drug resistant phenotypic growth. Another problem associated with therapy is high cost. Cisplatin a conventional drug used in the treatment of cancer is costly with respect to green synthesis based nano drug. This review provides a negative aspect of traditional cancer therapy with the development of new green nanotechnology based photodynamic therapy (PDT).

Keywords: Green nanotechnology, Cancer, PDT (photodynamic therapy)

The Characterization and Synthesis of CdTe Quantum Dots in Liquid Paraffin

Baruah L. ¹, Nath S. S. ^{2*} Bhattacharjee R¹.

¹Dept. of Physics, Assam University, Silchar (AUS) -788011, India

²Central Instrumentation Laboratory (CIL), Assam University, Silchar, India

*Corresponding author

Abstract

In order to synthesize CdTe quantum dots in liquid paraffin, we adopted chemical route that is simple easy and cheap. The prepared samples are characterized by X-ray diffractometry (XRD), high resolution transmission electron microscopy (HRTEM), UV-Vis absorption and fluorescence (FL) spectroscopy. Blue shifted absorption edge is observed for the CdTe samples. The average size of the quantum dots is determined to be less than 10 nm. Room-temperature luminescence is observed in the visible spectral range (orange). The prepared quantum dots are stable and their relative properties remain the same for a long period.

Keywords: CdTe, quantum dots, chemical route, optical properties.

Preparations of Stable Aqueous Dispersions of Calcium Carbonate and Clay Nanoparticle

Mende M., Schwarz D., Schwarz S. *

Leibniz-Institut für Polymerforschung Dresden e.V., Department of Polymers and Dispersions, Germany

**Corresponding author*

Abstract

Precipitated calcium carbonates (PCC) and china clays nanoparticle were characterized using laser light diffraction technique. The size of clay nanoparticle was 310 nm and that of PCC was 1.3 μm . The shape of the PCC and clay nanoparticle seemed similar as determined by SEM. The streaming potentials and net charges of all china clay nanoparticle dispersions were negative respectively. The dispersing agents are deionised water and polyvinylpyrrolidone (PVP). PVP acted as a stabilizing agent also. Rheological measurements and the determination of the sedimentation behavior by centrifugal separation analysis allow the investigation of the dispersions in an expanded concentration region under real conditions.

Keywords: Clay, nanoparticle, precipitated calcium carbonates, stability

The Quest for Nanotechnology: The United States of America Experience

Ugbolue, S. C.

Focus Nanotechnology Africa Inc (FONAI)

NY, New York City - Broad Street (HQ)

80 Broad Street, 5th & 6th Floors

New York City, New York 10004

United States of America

P.O. Box 763, Ithaca NY, USA

Abstract

Nanotechnology is the understanding and control of matter at the nanoscale, at dimensions between approximately 1 and 100 nanometers, where unique phenomena enable novel applications. Nano research and investigations encompass nanoscale science, engineering, and technology. This paper highlights the goals, structure, vision and contributions of the stakeholders in their efforts to ensure that the USA remains the world leader in the field of nanotechnology.

Magnetic Field Effects on the Optical Absorption and Polarizability of Donor in Quantum Dot

Zorkani I., * Mmadi A., Didi Seddik A., Jorio A.
NanoER, L. P. S, Département de Physique, Faculté des Sciences
Dhar Mehra, B. P. 1796, Fes, Morocco

Abstract

Using a variational method in the effective mass approximation, we have calculated the optical absorption spectra associated with transition between the ground state of a donor to the second conduction levels and the polarizability of donor impurity in quantum dot under an applied magnetic field. We have considered an infinite and finite confinement model to describe the barriers on the dot boundaries. We present our results as function of the size of the dot and several values of the magnetic field strength.

Keywords: Quantum dot, donor, absorption coefficient, polarizability, magnetic field

*Corresponding author

Sustainable Nanotechnology Policies for Innovation in Costa Rica

*Vega-Baudrit J. ^{1,3}, Núñez-Corrales S. ^{1,2}, Porras-Gómez M. ¹

¹Laboratorio Nacional de Nanotecnología (LANOTEC)
Centro Nacional de Alta Tecnología (CeNAT)

²Dirección de Tecnologías Digitales
Ministerio de Ciencia y Tecnología (MICIT)

³Laboratorio de Polímeros POLIUNA, Universidad Nacional
Heredia, Costa Rica

Abstract

The policies presented in this article address the creation of the National Plan for Sustainable Development of Nanotechnology in Costa Rica (*Plan Nacional de Desarrollo Sostenible de la Nanotecnología PNDN en Costa Rica*). This attempts to answer the social, economic and political challenges posed by the importance and pertinence of nanotechnology and nanoscience in modern society and, in particular for Costa Rica. Similar plans exist in Brazil, Colombia, Argentina, Venezuela and Mexico, which in turn exhibit higher indices in nanotechnology development than their regional counterparts. It is important to remark that the appropriate development of nanoscience and nanotechnology is significant not only at economic, social and environmental levels but at the scientific level also; generation of new knowledge- and education+innovation. The sustainable growth of a country must be tightly linked to the design and execution of plans that foster increments in science and technology production directed towards generating innovation. Therefore nanotechnology, as stated in the XXI Century Strategy for 2050, is considered one of the four fundamental pillars for the development of Costa Rica. Apart from the creation of the National Nanotechnology Laboratory (LANOTEC) at the National Center for Advanced Technology Studies (CeNAT) in 2004, the Ministry of Science and Technology promulgated a Public Declaration of Interest of the Research in Nanotechnology and its Applications on May 16th 2011. This declaration motivates public and private entities, in agreement with their material possibilities and formally stated legal and judicial normative, to contribute to scientific research efforts in nanotechnology and its applications by means of financial, logistic and technical contributions.

*Corresponding author

TiO₂ nanoparticles; it's antibacterial, anticancer and nanotoxicological impacts

* Yadav R.,¹ Saurabh Y.,³ Saran D.,⁴ Padam A.,² Sudhir S.,² Agarwal S.C.,³ Angarwal A.⁵

¹Department of Biotechnology, R.B.S. College, Agra, India.

²Central Drug Research Institute (CDRI), Lucknow, India

³Department of Chemistry, Agra College, Agra, India,

⁴Department of Physics, Institute of Basic Science, Dr. B.R.A. University, Agra, India

⁵Faculty of Engineering and Technology, Department of Chemistry, Agra

College, Agra, India

Abstract

We present the fabrication of water-soluble and biocompatible TiO₂ nanoparticles, its characterization and the photocatalytic capability towards antibactericidal, anticancer and toxicological action. The titanium dioxide nanoparticles at low pH have been synthesized by using sol-gel method. Normally they are typically insoluble in water. These are made water soluble by surface modification and characterized by XRD and TEM techniques. The XRD patterns revealed exclusive formation of anatase phase. XRD calculation (Scherrer's formula) and Transmission Electron Microscopic measurement are in good agreement. The particle size 20-30 nm shows better antibacterial, anticancer (Cervical cancer, Lung cancer, Breast cancer) and nanotoxicology effects.

Key words: Surface modification, XRD technique, TEM, Reactive Oxygen species, Nanoparticle

Advances in Nanofiltration

Ugbolue S. C.

Focus Nanotechnology Africa Inc. (FONAI)

P.O. Box 763 Ithaca, NY 14851

The BCC Research LLC in their Market Research Report showed that the global market for nanofiltration membranes increased from \$89.1 million in 2006 to an estimated \$310.5 million by 2012, a compound annual growth rate (CAGR) of 26.1%. The water treatment sector projected to account for 72.7% of total revenues in 2007, worth an estimated \$70.9 million in 2007 is expected to reach \$238.2 million by 2012, a CAGR of 27.4%. However, Frost and Sullivan in their US Membrane Separation Systems Market (2006) forecast the market to grow at a compound annual growth rate (CAGR) of 34.3% through 2015, and at a 37.2% CAGR from 2015 through 2020, reaching nearly \$2.2 billion in total revenues by 2020. Thus, this commentary highlights some of the developments and advances in nanofiltration and expanding areas of application.

Role of the Critical Micelle Concentration on the Stability of Carbon Nanotube Dispersions in Water

Tzavalas S.,^{1,2} Horechy A.,¹ Rojas R.,³ Detrembleur C.,⁴ Petzold G.,³ Schwarz S,^{3*} Stamm M.¹

¹Department of Nanostructured Materials, Institute of Physical Chemistry and Polymer Physics, Leibniz Institut für Polymerforschung Dresden e.V., D-01069 Dresden, Germany.

²ABB Corporate Research Ltd, 5405 Baden-Daettwil, Switzerland.

³Department of Polymers and Dispersions, Leibniz Institut für Polymerforschung Dresden e.V., D-01069 Dresden, Germany.

⁴Center for Education and Research on Macromolecules (CERM), University of Liege, B-4000 Liege, Belgium.

Abstract

Concentrated solutions of Sodium dodecylbenzene sulfonate (SDDBS) with higher than the nominal critical micelle concentration (CMC) of each surfactant have been prepared. Dispersions of carbon nanotubes in water with the aid of a surfactant are believed to be more stable when the surfactant concentration is close to the critical micelle concentration (CMC) value. This misconception can lead to poor dispersion of the nanotubes even more pronounced as the aspect ratio increases i.e. in SWNT dispersions. The present work shows that the optimum surfactant concentration for the highest nanotube stability to be obtained is not the CMC of the surfactant but that of the surfactant-nanotube system. The two may be similar but may also be significantly different as the CMC equilibrium shifts in the presence of nanotubes owing to the adsorption of the surfactant monomers onto the tubes surface.

Keywords: Carbon nanotubes, surfactant, stability

***Corresponding author**

Synthesis and characterization of nanocomposites based on polyaniline-gold/graphene nanosheets

Deepshikha S¹ and* Basu T.²

¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Noida, India. Pin 201303

²Amity Institute of Nanotechnology, Amity University Uttar Pradesh, Noida, India. Pin 201303

Abstract

Polymer nanocomposites (NSPANI-AuNP-GR) based on nanostructured polyaniline (NSPANI), gold nanoparticles (AuNP) and graphene nanosheets (GR) have been synthesized using in situ polymerization. A series of nanocomposites have been synthesized by varying the concentration of GR and chloroauric acid to optimize the formulation with respect to the electrochemical activities. Out of these series of NSPANI-AuNP-GR composites, it has been found that only one particular composite has the best electrochemical properties, as analyzed by Cyclic Voltammetry (CV) and differential pulse voltammetry (DPV) and conductivity. The best nanocomposite has been characterized by Fourier transform Raman spectroscopy (FT-Raman), UV-Vis spectroscopy, X-Ray diffraction (XRD) studies, Transmission electron microscopy (TEM), Scanning electron microscopy (SEM) and Atomic force microscopy (AFM). The CV of the best composite shows the well-defined reversible redox peaks characteristic of polyaniline, confirming that the polymer maintains its electro activity in the nanocomposites. Another nanocomposite has been prepared with identical composition (as found with the best nanocomposite) by mixing of pre-synthesized nanostructured polyaniline with chloroauric acid and graphene dispersion to order to predict the mechanism of in situ polymerization. It is inferred that the composite prepared by blending technique losses its property within 48 h indicating phase separation whereas the nanocomposite prepared by in situ technique are highly stable.

Keywords: Polyaniline, nanocomposite, graphene nanosheets, gold nanoparticles, electrochemical properties.

*Corresponding author

2011

Generation of mucinated cellulosic microfibers by mucin and microcrystalline cellulose hybridization; potentials for nanomedicine

¹Adikwu M. U., ²Builders P. F., ²Ezenwa P., ²Kunle O. O.

¹Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka;

²Department of Pharmaceutical Technology and Raw Materials Development, National Institute for Pharmaceutical Research and Development, Idu, Abuja, Nigeria, 410001 Nigeria.

Abstract

In this study generation of mucinated cellulosic microfibers was achieved by mixing of mucin (Mc) dispersion with solubilized microcrystalline cellulose (MCC) and recovered with acetone at controlled temperature conditions. Some physicochemical, functional and thermal properties of the new polymer moiety of mucin-cellulose (Mc-MCC) were determined using SEM, DSC, FTIR, etc. The generated polymer has high equilibrium swelling ratio and swelling time, and moisture sorption. This system when electrospun as nanofibers may have potential application in nanomedicine for drug delivery, scaffolds for tissue engineering, or provide support for bone repair.

Keywords: Mucin, cellulose, mucin-cellulose microfiber

** Corresponding author*

Nanotechnology in Latin America

VEGA-BAUDRIT J.

Laboratorio Nacional de Nanotecnología LANOTEC-CeNAT, Costa Rica

Abstract

Nanotechnology development in Latin America is at its primary stage with associated individual investigators mostly in the academia in thematic areas of nanomaterial, bionanotechnology, nanoelectronics, nanoeducation, etc. This report highlights the distribution of such development in Costa Rica, Argentina, Peru, Brazil, Columbia, Venezuela, Cuba, Chile, Mexico, Uruguay, etc.

Keywords: Latin America, bionanotechnology, nanoelectronics and nanoeducation

Proceedings: FONAI-USEACANI online conference June 21-26, 2009

Synthesis and characterization of CdS Nanowires, and CdS/TIS Nanoflower Grown in a Polymer Matrix by Chemical Bath Deposition (CBD) Method

*Ezema F.I., Ezugwu S.C., Ekwealor A.B.C., Asogwa P.U., Osuji R.U.

Department of Physics and Astronomy, University of Nigeria, Nsukka, Enugu, Nigeria

Abstract

CdS (Cadmium sulphide) films and CdS/TIS (TIS-thallium sulphide) heterojunction were synthesized on the glass substrate by chemical bath deposition (CBD) within the pores of polyvinyl alcohol (PVA) at room temperature. The bath is made up of solutions of cadmium chloride (CdCl_2), ammonia (NH_3), thiourea ($\text{SC}(\text{NH}_2)_2$), and PVA for fabrication of CdS nanowires. TIS thin films were deposited on glass substrate using a bath that contains thallium nitrate, sodium citrate, sodium hydroxide, thiourea and PVA. For fabrication of CdS/TIS nanoflower CdS, thin films were deposited on the TIS thin films. A chemical synthesis process for the fabrication of CdS nanowires and CdS/TIS nanoflower are presented in this research. In this present work, these films were annealed in air at 373 K. These properties were studied by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), and optical spectrophotometer. The optical properties revealed the presence of direct band gaps with energies 2.20eV for CdS and 1.80eV for CdS/TIS thin films. The films show poor transmittance in the visible and near infrared region of the solar spectrum.

Keywords: Chemical bath deposition, CdS/TIS heterojunction, nanowires, nanoflowers, structural and Optical studies

Part 1

Improving the tuning phenomenon of CdS quantum dot by Fe³⁺ Doping

Gope G. *, Nath S. S., Chakdar D., Das R.

Central Instrumentation Center, Assam University, Silchar
Department of Physics, Assam University Silchar, Assam, India.

Abstract

We synthesize CdS and Fe³⁺ doped CdS (CdS:Fe) quantum dots via chemical route at room temperature. In this technique, specimens are produced by simple chemical reactions embedded on polyvinyl alcohol (**PVA**). The samples have been characterized by high resolution transmission microscope (HRTEM), X-ray diffraction study, UV/VIS absorption spectroscopy and atomic force microscopy (AFM). These characterizations indicate the formation of quantum dots within 9 nm. Further, Impedance analyses of the samples are carried out to reveal the variations of admittance (impedance) with frequency. These results have been utilized to test CdS:Fe as nano tuned device with better quality factor in comparison to that of undoped CdS.

Keywords: Impedance analysis, iron center, nano tuned device, quality factor, resonance frequency.

Part 11

Syntheses of PVP embedded ZnO quantum dots and the investigation of their methanol sensing properties

Nath S. S. ^{1#}, Choudhury M. ^{*}, Nath R. K. ²

¹ Dept of Physics & Central Instrumentation Laboratory, Assam University, Silchar
Silchar-12, Assam, India.

^{*}Dept of Electronics Communication, NIT Silchar, Silchar-10, Assam, India

² Dept of Physics, NIT Agartalar, Agartala, Tripura West, India.

Abstract

We prepared ZnO quantum dots embedded in polyvinylpyrrolidone (PVP) matrix and reported their working as methanol sensor. The samples were prepared via quenching technique where bulk ZnO powder was calcined at very high temperature of 1100⁰C and then quenched in ice cold polyvinylpyrrolidone solution. The specimens were characterized by using X-ray diffraction study, UV/VIS spectroscopy, high resolution transmission electron microscopy and scanning electron microscopy. These studies indicated the sizes of quantum dots to be within 10 nm. The quantum dots were examined for methanol vapor sensing by exploring the variation of quantum dot resistance with time at different operating temperatures. It was revealed that ZnO quantum dots can sense methanol at low operating (200⁰C) temperature with very less response time.

Keywords: Quantum dot, sensor, methanol.

2010

Editorial Review: Melt Electrospun Nanofibers for Applications in Filtration

* Ugbolue S.C., Subramanian C. Warner S.B.
University of Massachusetts Dartmouth,
Department of Materials and Textiles,
North Dartmouth, MA 02747

Abstract

We have produced some nanofibers from melts by utilizing recently developed melt electrospinning facilities in our laboratory. One important aspect of nanofibers from melt is that dissolution of polymers in organic solvents and their removal/ recycling are not required. Thus, it is important to tailor the properties of melt-electrospun nanofibers (100 nm or less) for their commercial applications. To this end, the continuous production of nanofibers directly from polymer melts such as PCL PLA, PP, PET and their nanocomposites via multiple nozzle systems has been explored. This research would greatly lessen the potential environmental hazard of nanoscale materials and processing. The project also provides fundamental understanding of the structure- property relationships of melt electrospun nanofiber using PCL as a model polymer.

Keywords. Nanofiber, electrospinning, nanocomposites, PCL

*Corresponding author

Nanotechnology and Sustainable Development: The Place of Sub Sahara Africa and Policy Considerations

Ajibefun I. A.

Department of Agricultural Economics & Extension
Federal University of Technology, Akure, Nigeria

Abstract

Dramatic breakthroughs and technological changes in the form of nanotechnology have started to occur and will continue to occur in diverse areas such as agriculture, medicine, communications, computing, energy, and robotics. These technological changes will generate large amounts of wealth and force changes in existing markets and institutions. The ultimate purpose of science is social. Its relevance lies in its contribution to the well being of the society. Science performs this role in many ways. In an intellectual sphere, science perhaps embodies a way of life. While the developed countries in the U.S., Europe, Asia, as well some other developing countries are investing heavily in nanotechnology research, the developing countries, especially the Sub Sahara region is doing nothing in terms of funding of nanotechnology research. This will continue to cause technological poverty in this region and widen the development gap between Sub Sahara Africa and other region of the world. There is need for Sub Sahara Africa to design institutional and policy framework that will encourage the region to be an active participant in the nanotechnology revolution. This will not only ensure rapid socioeconomic transformation of the region, it will bring the region out of technological poverty.

Keywords. Nanotechnology, Sustainable Development, Policy, Sub Sahara Africa

Metal Oxide Silica Cellulose Nano Fiber Polyethylene (CeMOSPE) Composite Material

Okonkwo, E. M., Ofoegbu .O., Mmereole, J.U.

National Research Institute For Chemical Technology.

P.M.B. 1052, Zaria, Kaduna, Nigeria.

Abstract

Pulped baggase was used to produce cellulose nano fiber with high porosity. Sol-gel process was employed to obtain the metal oxide material (silica) and waste polythene material dissolved in a mixed solvent environment. The tensile strength and Young's modulus were enhanced with the increasing content of nano-silica. However, the elongation at break decreased as nano-silica content increased. The SEM micrograph shows the distribution of the silica within the polymer matrix. This natural-synthetic nano composite material with observed enhanced physio-mechanical properties, opens up another level of hybrid materials for the agricultural, landscaping, transport, automotive, building and construction industries.

Key words. cellulose nanofiber, Nano silica, solvated PE, Materials compatibility, composite,

*Corresponding author

Synthesis and Characterizations of CuSe (CS) Nano-Thin Films for Photovoltaic Applications

Ezekoye^a B. A.^b, Ezema F. I.^a, Arome A.^a, Eze E. N.^a

^aDepartment of Physics and Astronomy, University of Nigeria, Nsukka, Nigeria

Abstract

Thin films of CuSe were successfully synthesized for photovoltaic applications using chemical bath deposition (CBD) technique on glass substrates at room and elevated temperatures. The optical and structural properties of these films were determined. The deposited materials were identified by X-ray diffraction (XRD) and suggest a cubic structure with a lattice constant of 5.697\AA for films annealed at higher temperature of 523K. Transmittance and reflectance were found in the range of 50-60% and 30-40% using UV spectrophotometer; indicating high transmittance and low reflectance respectively. The absorption onset in the optical spectra of the annealed CuSe films showed a slight red shift in the infrared region. The peak absorption coefficient of $\sim 10^8\text{m}^{-1}$ was recorded with the film thickness between $0.10\mu\text{m}$ and $0.16\mu\text{m}$ or 100-160nm. The bandgap ranges from 2.0–2.3 eV for direct transition (E_{gd}) and 0.5–1.8 eV for indirect transition (E_{gi}) which shows that the film is a semiconductor nanofilm, a good candidate for nano-photovoltaic applications.

Key words. Thin film, chemical bath deposition (CBD), photovoltaics, optical and structural properties.

*Corresponding author

Nanotechnology and Sustainable Development: The Place of Sub Sahara Africa and Policy Considerations

Igbekele A. A.

Department of Agricultural Economics & Extension
Federal University of Technology, Akure, Nigeria

Abstract

Dramatic breakthroughs and technological changes in the form of nanotechnology have started to occur and will continue to occur in diverse areas such as agriculture, medicine, communications, computing, energy, and robotics. These technological changes will generate large amounts of wealth and force changes in existing markets and institutions. The ultimate purpose of science is social. Its relevance lies in its contribution to the well being of the society. Science performs this role in many ways. In an intellectual sphere, science perhaps embodies a way of life. While the developed countries in the U.S., Europe, Asia, as well some other developing countries are investing heavily in nanotechnology research, the developing countries, especially the Sub Sahara region is doing nothing in terms of funding of nanotechnology research. This will continue to cause technological poverty in this region and widen the development gap between Sub Sahara Africa and other region of the world. There is need for Sub Sahara Africa to design institutional and policy framework that will encourage the region to be an active participant in the nanotechnology revolution. This will not only ensure rapid socioeconomic transformation of the region, it will bring the region out of technological poverty.

Keywords: Nanotechnology, Sustainable Development, Policy, Sub Sahara Africa

Ejembi John Onah, D.Sc

Founding President Focus Nanotechnology Africa Inc (FONAI), Ithaca NY USA, Chairman Steering Committee, USEACANI, CO-Chair-US-EU-Africa-Asia-Pacific and Caribbean Academy of Nanoscience and Nanotechnology (USEACANN) and Editor-In-Chief, Journal Nanotechnology Progress International (JONPI). P.O.Box 763, Ithaca NY 14851, USA

Editorial Review: Nanoenergy; nanosolar cell

Abstract

Capturing solar light at UV-Visible by organic photovoltaic (polymer based solar cell) at efficiencies of 10-30% is an ideal that is crucial to alternative energy. This type of solar cell would be cheaper, lightweight, flexible, durable, etc as compared to commonly used silicon based solar cells that are expensive, fragile, heavy, etc. Further, such solar cells can be used indoors and outdoors because it captures energy at the entire light spectrum even as paints on buildings, cars, etc. The subject of this editorial review is to discuss architectures that can create such efficiencies thereby reducing the cost of energy to about 2 cent per watts instead of \$4-\$5 per watt by silicon solar cell compared to \$1 from fossil.

Keyword: Alternative energy, organic photovoltaics (OPV), solar cell, architectures

Nano-composite Polymer Electrolyte Membranes containing Nano-tubular Titania for Fuel Cells

. *Stewart K., Lalia B.S., Missan H. P. S

Department of Physics, University of West Indies, St. Augustine, Trinidad, West Indies

Abstract

Nano-composite polymer electrolyte membranes containing in-lab synthesized nano-tubular and particulate titanium dioxide have been developed based on fluoride backbone copolymer (polyvinylidene fluoride-co-hexafluoropropylene) (PVdF-HFP) for fuel cell applications. Nano-tubular titanium dioxide has been synthesized from titanium dioxide particles of varying size using hydrothermal method. The effect of time on the growth of titania nanotubes have been studied and is found to be maximum for 5 days. Nano-tubular structure has been confirmed using XRD and SEM spectroscopy. The developed nano-tubes are further used to synthesize nano-composite polymer electrolyte membranes and various properties have been studied. High ionic conductivity, good mechanical stability, good thermal stability has been observed for these membranes. High conductivity of the order of 10^{-3} S/cm has been observed for electrolyte membranes containing nano-tubular titania. The conductivity of nanocomposite membranes is almost one order higher than the membranes without any nano-tubular phase.

Keyword: Titanium dioxide, nanotubes, ionic conductivity, nanocomposite, XRD, SEM

(*) Corresponding author

Educating the next generation of scientists and engineers: Nanotechnology in the K-16 science curriculum

Aldrin E. S.

University of Central Florida

Abstract

Nanoscience and nanotechnology represent the most rapidly developing areas in contemporary scientific discovery and innovation. Nanoscience involves exploration and understanding of the fundamental behavior of structures having at least one dimension between 1 and 100 nm. Nanotechnology may be defined as the understanding and application of phenomena at the atomic level, leading to the design, construction and utilization of functional structures, again with at least one characteristic dimension measured in nanometers. Continuing advances in nanoscience and nanotechnology will impact all levels of science and engineering education.

Keyword: Nanoeducation, nanoscience, nanotechnology

Study of Electric Field Induced Second Harmonic (EFISH) Generation from Au and Ag implanted LiNbO₃ nano Composites

Chaudhary A.K. ^{*1,2}, Maaza M. ², Fasasi A.Y. ², Nandwandwe M. ^{2,3}, Beye A.C. ^{e²} and Neethling P. ⁴

1-Advanced Centre of Research in High Energy Materials, P-002, Science Complex, University of Hyderabad, Hyderabad-500046 (India)

2- Materials Research Group, iThemba Labs, Sommerset West, Cape –Town, South Africa

3- Department of Physics, Zululand University, South Africa

4- Department of Physics, Laser Research institute, University of Stellenbosch, Stellenbosch, Western Cape, South Africa

Abstract

Second Harmonic generation (SHG) using laser requires a non centro-symmetric materials or materials that lack inversion symmetry. However, symmetry breaking interface between metal – semiconductor can also permit third order process also known as EFISH .The paper reports the comparative study of EFISH generated from Au and Ag nano particles implanted on LiNbO₃ substrates using ion beam implantation technique . We have employed $\lambda = 782$ nm of Ti: Sapphire laser having repetition rate of 80 MHz pulse width of 85 ± 5 femto seconds with maximum pulse energy of the order of 10.5 nJ. The generated second harmonic signal is separated out from the fundamental using UV filter and detected with the help of PMT coupled with Lock-in amplifier . We have also tested the polarization effect and observed the presence of dipole mode in case of Au implanted nano composites and quarderpole mode in Ag implanted nano composites.

Keyword: SHG, Au and Ag nano particles, Lock-in-amplifier, plasmons

*Corresponding author

Overview on Nanotechnology Research, Development and Commercialization in Asia Pacific Region

Lerwen L.

NanoGlobe, Singapore

Abstract

This review covers progress of nanoscience and nanotechnology in Asia as an overview. It highlights policy and strategy and progress made on investment, infrastructures, research and development in this region. Further, it draws some helpful conclusions on this emerging revolutionary crucial field.

Keyword: Asia, nanotechnology, investment, infrastructures, research and development

Ejembi John Onah, D.Sc

Founding President Focus Nanotechnology Africa Inc (FONAI), Ithaca NY USA, Chairman Steering Committee, USEACANI, CO-Chair-US-EU-Africa-Asia-Pacific and Caribbean Academy of Nanoscience and Nanotechnology (USEACANN) and Editor-In-Chief, Journal Nanotechnology Progress International (JONPI).
P.O.Box 763, Ithaca NY 14851, USA

Editorial Review: Nano-frontrunners; implications

Abstract

It is expected that nanomarket will increase to about \$3.7 trillion in 2015 (Research and Markets, Dublin 2008). The sales for 2008 could be as high as \$200 billion according to the same Research Markets Dublin 2008. As a result of this potential in nanoscience and nanotechnology; every academia, country or government institution and private sector wants to be part of the race. Like any race; results are important as a measure of success and learning process for those that are not winning or that want to be included. Patent is very crucial as a measure of success by countries involved.

Keywords: Global nano, nanoprogress, nanopatent, ranking

Gold Nanoparticles Conjugated with Folic Acid using Mercaptohexanol as the Linker

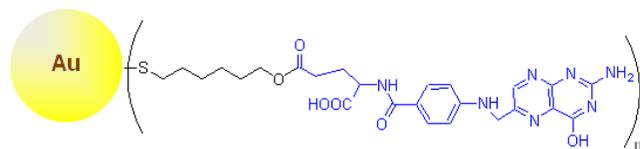
A. Shakeri-Zadeh, H. Eshghi, G. A. Mansoori^(*) and A. R. Hashemian

Departments of Bioengineering, University of Illinois at Chicago, Chicago, USA

(*) Corresponding author email: *mansoori@uic.edu*

Abstract

Nano-conjugation (also known as nano-coupling) is one of the important procedures to build nanotechnology platforms. We have designed a new nano-conjugate made of folic acid and gold nanoparticle (AuNP). This nano-conjugate has application for selective targeting of the folate receptor that is overexpressed on the surface of tumor cells. For this purpose, we conjugated 6-mercapto-1-hexanol, as a bifunctional linker, to folic acid through its (-OH) group with a (-O-CO-) linkage formation. Then, we made new (-SH) terminated product to react with H_{Au}Cl₄ in the presence of sodium borohydride and it was bound to the AuNP surface through its thiol group.



Finally, we evaluated the specific interaction between the folic acid and AuNP by the corresponding observed characteristic bands in the ultraviolet-visible (UV-vis) and Fourier transform infrared spectroscopy (FTIR) spectra. Transmission electron microscopic (TEM) images reveal the spherical AuNPs formation induced by the bifunctional linker. For such a new synthesized nanoconjugate, metallic peso-cubic structure ($\alpha=\beta=\gamma=90^\circ$) with lattice constants of $a=1.348$ nm, $b=1.348$ nm, and $c=0.725$ nm and (110), (011), (221), (321), (060), and (004) crystal planes were confirmed through powder X-ray diffraction. We estimated the average size of the conjugated nanoparticles to be about 3 nm by TEM. The Elemental analysis and atomic absorption showed around 70 % organic molecules on the surface of AuNPs. The procedure presented in this report may be applied to a variety of conjugations of interest in nanoscience and nanotechnology.

Keywords: 6-mercapto-1-hexano, Cancer Cell Targeting, Conjugated Nanoparticle, Folate, Folate Receptor, Folic Acid, Gold Nanoparticle, Nano-Conjugation, Nanotechnology

Study of the Relationship between Nanoparticles of Silica and Thermoplastic Polymer (TPU) in Nanocomposites

*Baudrit J.V. ^{1,2}, Ballester M. S. ², Martínez J. M. M. ³

1. Laboratorio Nacional de Nanotecnología LANOTEC-CeNAT, Costa Rica
2. Laboratorio de Polímeros POLIUNA-UNA, Costa Rica
3. Laboratorio de Adhesión y Adhesivos, Universidad de Alicante, España

Abstract

Nanosilicas with different silanol contents were obtained by treatment of hydrophilic fumed silica with dimethyldichlorosilane. This treatment reduced the silanol content and produced the particle agglomeration of the nanosilicas. Thermoplastic polyurethane (TPU) adhesives containing nanosilicas were prepared and characterized by FTIR spectroscopy, differential scanning calorimetry (DSC), plate–plate rheology, dynamic mechanical thermal analysis (DMTA) and transmission electron microscopy (TEM). It was demonstrated that addition of hydrophilic nanosilicas favored the degree of phase separation between the hard (i.e. isocyanate + chain extender) and soft (i.e. polyol) segments in the TPUs; the higher the silanol content on the surface of silica, the higher the degree of phase separation, and the crystallinity of the polyurethane (due to the soft segments) was also increased. Hydrogen bonds between the ester carbonyl groups in the TPU and the silanol groups on the silica surface were created and more favored by increasing the silanol content.

Keywords: silica, nanosilica, polyurethane, nanocomposites, and nanoparticle.

*Corresponding author

Single-cycle- infection Viral Vectors as Model Probes for Antiviral Screening, Potential Application in Nanomedicine

Esimone C. O.

Pharmaceutical Microbiology and Biotechnology Research Unit
Department of Pharmaceutics
University of Nigeria, Nsukka, Enugu State, Nigeria

Presently at
Department of Pharmaceutics
Nnamdi Azikiwe University Awka, Nigeria

Abstract

Alternative screening for nanomedicines applications, especially in the search for novel antiviral agents is very dire. Due to salient problems related with safety, speed, flexibility and cost associated with traditional antiviral screening techniques, alternative screening methods devoid of these limitations are constantly being sought for. Our approach has been largely based on the use of recombinant viral vectors expressing various reporter genes that could be diversely engineered to mimic the wild type parental virus as much as is required. To guarantee safety, the viral vectors are also engineered to undergo only a single replicating cycle. Using such recombinant single-cycle-infection viral vectors based on lentiviruses, retroviruses and adenoviruses as model probes, we have screened several medicinal plants for anti-HIV and anti-adenoviral properties.

Keywords: Viral vectors, probes, anti-HIV

Editor-In-Chief

Dr. Ejembi John Onah

Professor of Chemistry, Nanoscience and Nanotechnology

President/CEO, Focus Nanotechnology Africa Inc. (FONAI)

Editorial Board Member

Honorary:

1. Nobel Laureate Dr. Zur Hausen, Professor University of Heidelberg
2. Nobel Laureate Dr. Richard Ernst, Professor Swiss Federal Institute of Technology Zurich
3. Nobel Laureate Dr. Karl Barry Sharpless, Professor Scripps Institute USA
4. Nobel Laureate Dr. Mario R. Capecchi, Professor Howard Hughes Medical Institute, University of Utah School of Medicine.
5. Nobel Laureate Dr. Albert Fert, Professor University of Paris Sud in Orsay and Adjunct Professor at University of Michigan, USA.

Active members:

1. Dr. Harinder Missan, Professor, University of West Indies, Trinidad and Tobago, Caribbean
2. Dr. Malik Maaza, Professor, Ithemba Lab, Africa
3. Dr. David Hui, Professor, University of New Orleans, USA
4. Dr. Aldrin Sweeney, Professor, University of Central Florida, USA
5. Dr. El-Shall Samy, Professor, Virginia Commonwealth University, USA
6. Dr. Stanley Moffatt, Professor, Reagent University Accra, Africa
7. Dr. Ishenkumba Kahwa, Professor, University of West Indies, Caribbean,
8. Dr. Helen Asemota, Professor, University of West Indies Jamaica and Shaw University, USA and Caribbean
9. Dr. Sossina Haile, Professor, CALTECH, USA
10. Mr. Paul Iwezulu, Manager/Attorney UK, Europe
11. Dr. Mansoori, Professor University of Illinois Chicago, USA
12. Dr. Lubomir Lapcik, Professor, Thomas Bata University, Czech, Europe

13. Dr.Ajibefun; Professor, Federal University of Technology Akure, Africa
14. Dr.G. Egharevba, Professor, Obafemi Awolowo University, Ife, Africa
15. Dr.Anil Chaudhary, Professor, University of Hyderabad, India
16. Dr.Nelson Ocheke, Professor, University of Jos, Africa
17. Dr.José Vega Baudrit, Professor, National Laboratory of Nanotechnology, Costa Rica,
18. Dr.Jean Ebothe, Professor, University of Reims, France, Europe
19. Dr. Samuel Ugbolue, Professor, University of Massachusetts Dartmouth, USA
20. Dr.Yong Lak Jo, Professor, Cornell University, USA
21. Ex-Senate President, Ameh Ebutte, Africa
22. Dr.Zorkani Izzedine, Dhar Mehraz University, Morocco, Africa
23. Dr.Michael Adikwu, Professor UNN, Africa
24. Dr. David Wilson, Professor, Cornell University, USA
25. Dr. Eden Manut, Professor, Ovidius University, Constanza Romania, Europe
26. Dr. Benjamin Ezekoye, Professor, University of Nigeria, Nsukka, Africa
27. Dr. Charles Esimone, Professor, Nnamdi Azikiwe University, Awka, Africa
28. Dr. Anthony Attama, Professor, University of Nigeria, Nsukka, Africa
29. Dr. Mauricio Terrones, Professor, National Laboratory for Nanoscience and Nanotechnology, Mexico, South America
30. Dr. Fabian Ezema, Professor, University of Nigeria, Nsukka, Africa
31. Ex-Congressman Sherwood Boehlert, USA
32. Dr. Emma Smith, University of West Indies, Barbados
33. Dr. Lerwen Liu, NanoGlobe, Singapore
35. Dr. Joydeep Dutta, Professor, Asian Institute of Technology, Thailand
36. Dr. Simona Schwartz, Institute of Polymer Research, Dresden, Germany
37. Dr.KD. Verma, Professor, S.V. (P.G.) College, Aligarh, India

