

**Abstracts US-EU-Africa-Asia-Pacific and Caribbean Nanotechnology Initiative
(USEACANI) Workshop Online June 21-26, 2009.**

1.US-EU-Asia-Africa-Pacific and Caribbean Nanotechnology Initiative (USEACANI); nanobasket

Ejembi John Onah
Focus Nanotechnology Africa Inc (FONAI)
Ithaca New York

Abstract

Nanobasket is a definition for multi-disciplinary, multi-institutional and multi-national approaches to nanosciences and nanotechnology. The coming together of different professionals, institutions and nations to identify and solve nanosciencetech problem is the hallmark of scientific discovery. This paper will discuss new perceptions to formation of nanonetwork, directions and applications: The USEACANI activities in the 158 countries with special focus on the 84 countries of US, Africa, Caribbean and Pacific including research directions on renewable nanoenergy sources, synthesis of drug delivery systems and vaccines for prevention and cures of HIV/AIDS, cholera, malaria, tuberculosis, tumor, cancer, solar cell, nanofiltration, nanosensors, etc will be highlighted for applications in nanoenergy, nanomedicine, naoeducation, etc.

Keywords: Nanobasket, nanoenergy, nanomedicine, nanosensors, nanofiltration, nanoagriculture

2.Synthesis, Characterization and application of nanoparticles, nanowires and polymer nanocomposites

M. Samy El-Shall

Department of Chemistry, Virginia Commonwealth University
Richmond, VA 23284-2006, USA

Abstract

Nanoparticles often exhibit novel properties, which are different from the bulk Materials properties. Research in this area is motivated by the possibility of designing nanostructured materials that possess novel electronic, optical, magnetic, photochemical and catalytic properties. Such materials are essential for technological advances in quantum electronics, nonlinear optics, photonics, and information storage and processing. Results on the synthesis and characterization of a variety of semiconductor, metallic and intermetallic nanoparticles and nanowires will be presented. Further, results on the synthesis of size-selected alloy nanoparticle catalyst systems will presented. The effects of lasers irradiation on the size distribution and composition of the alloy and core-shell nanoparticles will be presented. The use of the bimetallic nanoparticles as catalysts provides an opportunity of tuning the catalytic activity to the desired performance depending on the composition of the nanoalloy, the nature of the oxide support, and the size and shape of the nanoparticle alloys.

Keywords: Nanoparticles, catalysis, microwave, energy, polymer nanocomposites

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

Aldrin E. Sweeney
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. This research work will discuss emerging issues on nanoeducation at K-16.

Key words: Nano-education, K-16

4 a Nano-impacts of Food Glycemic Indices in type 2 diabetes: Analyzing the interplay of fiber and incretins in glucose release and absorption in the small intestines

Perceval S. Bahado-Singh^{1,2}, Andrew O. Wheatley^{1,2}, and [Helen N. Asemota^{1,2}](#)

¹Biotechnology Center, ²Department of Basic Medical Sciences (Biochemistry Section)
University of the West Indies, Mona Campus

Abstract

The worldwide pandemic of type 2 diabetes cases, which has significantly increased in recent years in children and adolescents, may seem as if the battle to prevent the development of the disease has been lost. Despite this ever-growing problem, some studies have shown some success in the management of the disease through the application of the glycemic index (GI) concept. Research has revealed that foods with low GI and high in fiber reduce gastric emptying and slow the rate of absorption of nutrients into the blood stream. Equally, it has been shown that incretin gastrointestinal hormones have similar effects. This study is designed to elucidate at the nano-level, using atomic force microscopy, the interplay of low GI vs. high GI foods, glucagon-like peptide-1 (GLP-1) and gastric inhibitory peptide (GIP) on the microvilli cuboidal and columnar epithelium brush border nanostructures of the jejunum, duodenum and ileum in a type 2 diabetes animal model. It is expected that elucidating the GI – based nano-impacts of carbohydrate-rich foods may prove useful in diabetes education as well assist health care professionals, nutritionists and health-conscious individuals in diabetes management. It will also facilitate the effective planning of diets so as to reduce the incidence of post-prandial spikes in blood glucose levels and thus reduce the risk of associated deadly hypoglycemic comas. In addition, understanding the role of fiber and incretins in the absorption of glucose should prove beneficial in the development of value-added food products for diabetics or those at risk.

Keywords: Food glycemic indices, diabetes, incretins

4b. ORTANIQUE PEEL BIOMOLECULES: CHARACTERIZATION AND NANOPARTICULARIZATION FOR POTENTIAL BIOMEDICAL APPLICATION

¹Curtis O. Green, ^{1,2}Andrew O. Wheatley, ¹Lowell L. Dilworth and ^{1,2,3}[Helen N. Asemota](#)

¹Department of Basic Medical Sciences (Biochemistry), ²Biotechnology Centre,
University of the West Indies, Mona, Jamaica,

³Dept. of Nat. Sciences & Maths, Nanobiology Division, NNRC,
Shaw University, Raleigh, NC., USA.

Abstract

Polymethoxylated flavones (PMFs) are flavonoids that are almost exclusively found in Citrus peel and display potent anti-hypercholesterolemic, anti-cancer, anti-atherosclerotic and anti-diabetic properties. Jamaica is the leading producer of citrus in the Caribbean . A vast majority of the citrus fruits that are harvested are used for citrus juice production which results in large quantities of citrus peel and other citrus by-products that can be used to generate kilogram quantities of PMFs. PMFs supplementation has been shown to result in the reversal of metabolic defects associated with diabetes, including a decrease in insulin level and an improvement in glucose tolerance. Nanoparticles made from retinoic acid coated with CaCO_3 (nanoeegg –atRA) were recently developed as a new drug delivery system with possible anti-diabetic application. The nanoparticles stimulated insulin secretion from islets in a glucose-dependent manner in streptozotocin-induced diabetic rats. This study was designed to characterize PMFs from the Jamaican citrus ortanique as well as to fabricate nanobiomaterial from the PMFs for possible biomedical usage.

Keywords: Orthinique, flavoids, anti-cancer

5. Tailored nano-systems for energy and photonics applications: ongoing projects within the Nanosciences African Network

M. Maaza^{1,+}, A.C. Beye², N. Manyala³, I. Zorkani⁴, T. Otiti⁵, H. Aourag⁶, A. Fasasi⁷, A. Mensah⁸, N. Torto⁹, K. Chinyama¹⁰, S. Eljaziri¹¹, E. Minani¹², J.M. Ndjaka¹³ and D. Genene¹⁴

Abstract

Since its inception, the Nanosciences African Network has implemented various programs among them the junior and senior fellows visiting sub-program. Within such a sub-program, African fellows from different parts of the continent conduct various research projects with a net focus on nano-materials for energy and photonics applications. This contribution will report on new and ongoing R&D nano-activities of the NANOAFNET and its synergies within the international landscape.

Keywords: Energy, photonics.

6. A Novel PLGA-PEG-PLGA-encapsulated NGR-coupled Stealth PEI/pDNA Nanoparticle Assembly for Targeting Human Monocyte-derived Dendritic Cells: A Paradigm for Efficient DNA Vaccination.

[Stanley Moffatt](#)^{1,2,*}, Richard J. Cristiano¹

¹Department of Genitourinary Medical Oncology, Laboratory of Experimental Therapeutics, University of Texas M.D. Anderson Cancer Center, 1515 Holcombe Blvd., Houston, TX 77030, USA.

²Current address: Dean, School of Informatics and Engineering, Regent University College of Science and Technology, P.O. Box DS 1636 Accra-Ghana, West-Africa.

Abstract

To evaluate and improve dendritic cells (DCs) as effective antigen presenting cells for vaccination, we investigated the *in vitro* uptake, toxicity, phenotypic consequences and transfection efficiency of stealth NGR/PEG/PDBA-coupled-SHA-PEI/pDNA targeting nanoparticles loaded with PLGA-PEG-PLGA tri-block copolymer in human monocyte-derived DCs. Modification with PEG effectively shielded and reduced non-specific phagocytosis by immature DCs to approximately 20%. Coupling the tumor-specific NGR peptide to the PEGylated nanoparticles (NGR/PEG/PDBA-SHA-PEI/pDNA) however resulted in specific and enhanced phagocytosis in DCs. DNase treatment had no effect on DNA integrity in the encapsulated nanoparticles. Confocal microscopy confirmed intracellular localization of the targeting NGR/PEG/PDBA-SHA-PEI/pDNA nanoparticles, resulting in more enhanced uptake of the radiolabeled plasmid DNA and approximately 5- and 10-fold increase over the control tri-block Pluronic F68 copolymer and the non-targeting polyplex respectively. More importantly, phagocytosis of the targeting nanoparticles neither altered the functionality of immature DCs nor the phenotypic expression of DC-specific cell surface molecules, CD80, CD86, CD40 and CD54 (ICAM-1), suggesting that uptake of the targeting nanoparticles by themselves did not induce DC maturation. Taken together, these results suggest that PLGA-PEG-PLGA encapsulation of this novel, stealth, and targeting nanoparticle assembly has no negative effects on key properties of immature DCs and should pave the way for efficient targeting of dendritic cells for vaccination purposes.

Keywords: Polyethyleneimine (PEI); PLGA-PEG-PLGA; polyethylene glycol (PEG); phenyl(di)boronic acid (PDBA); salicyl hydroxamic acid (SHA); NGR peptide; dendritic cells; targeted delivery : DNA vaccination

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

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

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

Abstract

CdS films and CdS/TIS heterojunction were synthesized on the glass substrate by chemical bath deposition (CBD) within the pores of polyvinyl alcohol (PVA) at room temperature. The chemical bath for the deposition of CdS is made up of solutions of cadmium chloride (CdCl_2), ammonia (NH_3), thiourea ($\text{CS}(\text{NH}_2)_2$), and PVA for fabrication of CdS nanowires. Thallium sulphide (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, the deposited TIS thin films were immersed into bath for deposition of CdS thin films. A chemical synthesis process for the fabrication of CdS nanowires and CdS/TIS nanoflower is presented herein. In this present work, these films were annealed in air at 373 K and characterized for the structural, morphological, and optical properties. 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; Cadmium sulphide; CdS/TIS heterojunction; nanowires; nanoflowers; structural; and optical studies

8. Nanotechnology and the Creation of a More Equitable World

Donald C. Maclurcan¹

Institute for Nanoscale Technology, University of Technology, Sydney Australia

Abstract: Nanotechnology is presented by many as holding considerable potential to create a more equitable world, both in terms of addressing social needs and creating new opportunities for innovation in the Global South. Yet, history shows that context plays a considerable role in development outcomes, as highlighted by new inequities that are grounded in access to recently emergent technologies. In a rapidly globalising environment compounded by financial crisis and anthropogenic global warming, there appears a need to shift to a new development paradigm that is people centred and reflexive. This paper draws on development literature as well as mixed methods research, conducted since 2004, that has looked at quantitative indicators of nanotechnology's global emergence as well as perspectives from 'key informants' from both Thailand and Australia. It is argued that contemporary debates show the critical need to address issues of ownership, control, appropriateness, uncertainty and expanded notions of risk, as well as technological governance. In response, this paper proposes new explorations into nanotechnology's potential synergy with mechanisms such as Open Source design and Real-time Technology Assessment.

Keywords: Nanotechnology, inequity, human needs, innovation, paradigm, reflexive development

9. Lanthanide(III) clusters: metal – metal interactions

[I.A. Kahwa](#), M. A. Singh-Wilmot, R. U. Richards Johnson and S. P. McKenzie

T. Dawkins and T. C. Wedermier-Davis

*Department of Chemistry, The University of the West Indies
Mona Campus, Kingston 7, Jamaica*

Abstract

There is considerable interest in the preparation, structural characterization and physical and chemical behaviours of multi-centre lanthanide (III) compounds. While there are challenges in the preparation and definitive structural characterization by X-ray diffraction methods, information from successful efforts indicates that such systems have attractive chemical and electronic cooperative behavior worthy of detailed exploration. For example, a dinuclear lanthanide (III) system was found to accelerate phosphate hydrolysis at a rate that is two orders of magnitude higher than that of a mononuclear one. Further, many-body electronic processes were found to dominate luminescent behaviors of several dinuclear and pentanuclear lanthanide (III) clusters and one dimensional metal centre arrays. This presentation will explore the: (i) challenges associated with the preparation of lanthanide (III) clusters and possible ways of overcoming them (ii) clusters' diverse structural motifs (iii) chemical properties associated with polynuclearity (iv) luminescent behaviors associated with cooperative electronic interactions; and (v) potential areas of further investigation such as energy up-conversion in clusters containing multiple proximal Ln³⁺ ions.

Keywords: Lanthanides, clusters, cooperative behavior

10. Nanostructured Electrochemical Biosensors

Omowunmi A. Sadik

Department of Chemistry

Center for Advanced Sensors & Environmental Monitoring (CASE)

State University of New York-Binghamton

P. O. Box 6000

Binghamton, NY 13902

Abstract

The specificity, simplicity, and inherent miniaturization afforded by advances in modern electronics have allowed electrochemical sensors to rival the most advanced optical protocols. One major obstacle in implementing electrochemistry for studying biomolecular reaction is its inadequate sensitivity. Recent reports however showed unprecedented sensitivities for biomolecular recognition using enhanced electronic amplification provided by new classes of electrode materials (e.g. Carbon nanotubes, metal nanoparticles, and quantum dots). Biosensor technology is one area where recent advances in nanomaterials are pushing the technological limits of electrochemical sensitivities, thus allowing for the development of new sensor chemistries and devices. In this presentation, we will focus on our recent work, based on metal-enhanced electrochemical detection, and those of others in combining advanced nanomaterials with electrochemistry for the development of smart sensors for environmental, biomedical, bioprocess and security applications.

Keywords: Metal-enhanced detection, MED, nanostructured materials, electrochemistry, sensors

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

Igbekele A. Ajibefun
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 economic impacts. 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

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

[A.K. Chaudhary](#)*^{1,2}, M. Maaza², A.Y. Fasasi², M. Nandwandwe^{2,3}, A.C. Baye² and P. Neethling⁴

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 nanocomposites.

Keywords: SHG, Au, Lock-in-amplifier, plasmons

13.Evaluation of Surface Modified Solid Lipid Nanoparticles Containing Nevirapine, an Antiretroviral Drug for Controlled Delivery and Targeting

Attama A.A.

Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka 410001, Enugu State Nigeria.

Abstract

Surface modified solid lipid nanoparticles (SM-SLN) formulation as a sustained delivery system of nevirapine, a prototype antiretroviral drug is described. SM-SLN containing nevirapine with and without phospholipid was formulated by melt emulsification with high pressure homogenisation and characterized by particle size, wide angle X-ray diffraction, encapsulation efficiency and in vitro drug release using a modified Franz diffusion cell. Results show very small and stable particles with low polydispersity indices, increased encapsulation efficiency and sustained in vitro release on addition of phospholipid. Sustained (and controlled) release and permeation across the artificial membrane was achieved. This nanoenabled delivery system of nevirapine could offer better way of targeting the virus (HIV) causing AIDS to reduce the number of deaths as a result of the disease.

Keywords: Surface modified solid lipid nanoparticle (SM-SLN), nevirapine, sustained/controlled release, permeation.

14. Single-cycle- infection Viral Vectors as Model Probes for Antiviral Screening Studies in Nanomedicine and Nanobiotechnology

Charles O Esimone

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

Abstract

Alternative screening for nanomedicines and/or for nanobiotechnological 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 replicative cycle. Using such recombinant single-cycle-infection viral vectors based on lentiviruses, retroviruses and adenoviruses as model nanoprobess, we have screened several medicinal plants for anti-HIV and anti-adenoviral properties.

Key words: Viral vectors, nanoprobess, anti-HIV

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

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

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

^bAuthor to whom all correspondence should be addressed

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 5.697Å for films annealed at higher temperature of 523K. Optical characterization was performed using the UNICO UV-2102PC spectrophotometer at normal incidence of light in the wavelength range of $\lambda = 200-1000\text{nm}$. Transmittance and reflectance were found in the range of 5-50% and 2-20%, 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 μm and 0.16 μm or 100-160nm. The bandgap ranges from 2.0 – 2.3 eV for direct transition (dir) and 0.5 – 1.8 eV for indirect transition (indir) which, shows that the film is a semiconductor nanofilm, a good candidate for nano-photovoltaic applications.

Keywords: Thin film, chemical bath deposition (CBD), photovoltaics, optical and structural properties

16. Study of the relationship between nanoparticle of silica and thermoplastic polymers (TPU) in nanocomposite

[José Vega Baudrit](#)^{1,2}, [María Sibaja Ballester](#)²

1. Laboratorio Nacional de Nanotecnología LANOTEC
2. Laboratorio de Polímeros POLIUNA

Abstract

Fumed silica is added in polymeric systems due to its properties as rheological modifier. In this case, the fumed silica dispersed in a polymeric adhesive acts as a rheological agent, providing control of viscosity, thixotropy, and acting as an agent for sedimentation control. The wide variety of applications of fumed silica is a product of the hydrophilic and hydrophobic surface nature. In the first case, the interactions in silica are due to hydrogen bonds formed between the silanol groups and polymeric polar groups.

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), transmission electron microscopy (TEM) and strain-stress testing. 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. The tensile strength increased and the elongation at break of the polyurethane decreased by increasing the silanol content of the nanosilica. The higher the mechanical and the rheological properties of the polyurethanes containing nanosilicas with different silanol content, the higher the final adhesive strength.

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

17. Conjugation of gold nanoparticles with folic acid (For cancer cells nanotechnology-based targeting)

G. A. Mansoori, A. Shakeri-Zadeh, A. R. Hashemian

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

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 tumoral cells. For this purpose, we made 4-aminothiophenol, as a bifunctional linker to react with HAuCl₄ in the presence of sodium borohydride and it was binded to the AuNP surface through its thiol group. Then, we conjugated amino-terminated nanoparticles to folic acid with an amide linkage formation. 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. Powder X-ray diffraction (XRD) patterns confirmed the metallic face-centered cubic (fcc) lattice structure with (111), (200), (220), and (311) crystal planes. We estimated the average size of the conjugated nanoparticles to be about 48 nm by TEM and XRD. The Elemental analysis and atomic absorption showed 59 % 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: 4-Aminothiophenol, cancer cell targeting, conjugated nanoparticle, folate, folate receptor, folic acid, gold nanoparticle, nano-conjugation, nanotechnology,

18. Generation of mucinated cellulosic micro-fibers by mucin and microcrystalline cellulose hybridization with potentials for nanomedicine

¹P. F. Builders, ¹O. O. Kunle, ¹P. Ezenwa and ²[M. U. Adikwu](#)

¹Department of Pharmaceutical Technology and Raw Materials Development, National Institute for Pharmaceutical Research and Development, Idu, Abuja, Nigeria;

²Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, 410001 Nigeria.

Abstract

Cross-linked polymers have been shown to be of benefit in nanomedicine. In this study generation of mucinated cellulosic micro-fibres was achieved by mixing of mucin (Mc) dispersion with solubilised microcrystalline cellulose (MCC) and recovered with acetone at controlled temperature conditions. Some physicochemical, functional and thermal properties of the new polymer moiety (Mc-MCC) were determined and compared with that of Mc and MCC. The generated hybrid polymer had the highest equilibrium swelling ratio and swelling time, and moisture sorption. The SEM images showed that the Mc-MCC hybrid fibers were similar to that of MCC, but bigger and denser than that of the MCC. The DSC thermographic spectra and FT-IR spectra show that the hybrid polymer is characteristically different from that of both Mc and MCC. The FT-IR and DSC spectra showed fingerprint indicating a polymer moiety different from either MCC or Mc. 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-Avicel hybrid; mucin; avicel; physicochemical properties; functional properties; thermal properties

19. Melt electrospun nanofibers for applications in filtration

[Samuel C Ugbole](#), Chitrabala Subramanian and Steven B Warner
University of Massachusetts Dartmouth,
Department of Materials and Textiles,
North Dartmouth, MA 02747

Abstract

We have produced 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 – 1 μ m) for their commercial applications. To this end, the continuous production of submicron-scale fibers directly from polymer melts such as PCL PLA, 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: Nanofibers, electrospinning, nanocomposites

20. Nano-composite polymer electrolyte membranes containing nano-tubular titania for fuel cells

Kerrilee Stewart, Boor Singh Lalia and Harinder Pal Singh Missan*

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 have 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 and has been attributed to the modification of properties of the membranes by nano-tubular phase.

Keywords: Titanium dioxide, nanotubes, ionic conductivity, composite, XRD, SEM

21.Nano Financing: Prospects for industrial development

Paul Iwezulu, UK

Abstract

One would ask, why the subject of finance amidst this gathering of eminent scientists? The answer could be because there is no way you can talk of development in this commercial and technological age without mentioning money. To be more succinct to the point, parties and agencies focusing on development of nanotechnology and applications have since 2004 (or even prior to) been scratching heads for finance. It has been difficult, not because you do not have a fine product or technology, but because you have one that is untested at commercial level, a product that is mainly a "prototype" so to say. There is no track record in the industry of successful financial models which bankers and other financiers they can rely upon for assessment of profitability, However, an entrepreneur, must not be deterred by all the risks and difficulties that attain commercialization of technological breakthrough but has to forge ahead in pursuit of aims. This paper therefore discusses nanofinancing and prospects for industrial development.

Keywords: Nano-financing, industrial development, entrepreneur

22. Nano 'CeMOSPE' Composite Material

Okonkwo, E. M., Ofoegbu .O.and 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 fibrils with high porosity, sol-gel process employed to obtain the metal oxide material (silica) and waste polythene material dissolved in a mixed solvent environment. A composite blend of the three intermediate raw materials was done with the solvated PE as the matrix, the nano fibril cellulose as substrate and oxide of silicon as filler. The solvent was recovered using simple filtration and subsequent distillation and the residual composite material, compression moulded into sheets of differing dimensions. The mechanical strength of the product vis- a- vis tensile, bending and compressive strengths and a study of yield strength, ultimate tensile strength, %elongation at break, engineering stress(s) and strain, were determined while the material toughness(work to fracture), was calculated as the area under the stress-strain curve. The surface material distribution was determined using field emission scanning electron microscopy. 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.

Keywords: Cellulose, fabril, silica, solvated PE, materials compatibility, composite,

23.HIV/AIDS in Africa and the Caribbeans: A descriptive analysis of the human immunodeficiency virus (HIV) infected patients in a Nigerian mission hospital for applications in nanomedicine

Odumu Paul. A.
Senior Registrar,
Department of Family Medicine,
ECWA Evangel Hospital,
PMB 2238, Zaria Bye-pass,
Jos, Plateau State,
Nigeria.

Abstract

Analysis of HIV at ECWA hospital, Nigeria-sub-saharan Africa shows a total of 835 patients tested positive out of 6240 screened. 577 (67.5%) were females, 278 (32.4%) were males giving a male to female ratio of 1:2. Their ages ranged from 2weeks to 75 years, with mean age of 32 years (SD = 11.5). The out patient department (OPD) and antenatal clinic (ANC) had the highest HIV positive patients – 59.5% and 13.7% respectively. The 21-30 and 31-40 year age ranges had the highest percentage of HIV positivity of 43.1% and 24.5% respectively. Females were found to be 3-5 times more likely to be infected than males below 30 years, but more males than females had HIV infection after 40 years. Paediatric patients had 4.5% testing HIV positive. Young adults (20-30 years) are more likely to have HIV infection. Women and girls below 30 years still bear the larger burden of the infection. Urgent steps focused at HIV prevention among adolescents/young adults need to be put in place. Prevention of mother-to-child-transmission (MTCT) needs to be stepped up just as women/girl-child must be empowered to fight against HIV infection. HIV counselling and testing (HCT) must be intensified in every part of the hospital-especially the OPD

Keywords: Human immunodeficiency virus (HIV), acquired immunodeficiency syndrome (AIDS), age, gender.

24. How to foster nanoscience and nanotechnology in the developing world: The importance of multidisciplinary work and international collaborations

Mauricio Terrones

National Laboratory for Nanoscience and Nanotechnology Research (LINAN) and
Advanced Materials Department, IPICYT, Camino a la Presa San José 2055, San Luis
Potosí, 78216, SLP, México;

Abstract

It is clear that nanoresearch has developed very fast over the last 10 years and novel technologies are underway and will be in the markets within a short term. Developed countries have taken the lead on these developments. However, developing countries have great human potential and vast resources to foster nanoscience and nanotechnology worldwide. This talk will emphasize the importance of international collaborations and multidisciplinary work in the area that need to be boosted in developing countries. Some successful examples of joint collaborations involving exchanges of students and researchers will be presented. Some expert views in the nano-research field will also be discussed in order to foster and develop nanoscience and nanotechnology in the developing world.

Keywords: Nanotechnology, developing countries, collaborations

25. Incidence of antibiotic resistant bacteria in; the Ondo State of Nigeria case study and nanomedicine approaches.

¹ Onifade , A. K. , ¹ Agara-Jackson, O.O. , ² Jeff-Agboola, Y. A. , and ¹ Daso , I. O.

¹ Department of Microbiology, Federal University of Technology, PMB 704, Akure, Nigeria.

² Department of Food Science and Technology, Federal University of Technology, PMB 704, Akure, Nigeria.

Abstract

Recent advances in the field of nanotechnology led several groups to recognize the promise of recruiting nanomaterials to the ongoing battle against pathogenic bacteria. A large battery of newly discovered and developed nanomaterials has been accumulating during the last decade, therefore, it could be anticipated that it should only be a matter of time until such preliminary nanomedicine applications are presented. We review some of these pioneering studies in which nanomaterials have been evaluated as potential therapeutics, antiseptics or disinfectants. This study focuses on antibacterial nanomedicines that are based solely on synthetic (artificial) materials. The study describes the application of nanoparticles of medical origin in a modified form as antibacterials. Faecal samples were collected from Akure south, Akure North, Owo and Ondo Local Government Areas of Ondo State Nigeria into a sterile universal bottles containing normal saline solution. The organisms isolated from the faecal samples were mostly Gram negative bacilli/rod, and Gram negative cocci bacteria Gram positive cocci bacteria. The bacterial isolates include *Escherichia coli*, *Serratia marcescens*, *Enterococcus faecalis*, *Enterococcus faecium*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Enterobacter sp*, *Bacillus licheniformis*, *Bacillus subtilis* and *Acinetobacter sp*. All the organisms were resistant to Augmentin and Ceftriaxone. Most are resistant to Amoxylin, Tetracycline and Cotrimoxazole. All the organisms were highly sensitive to Ofloxacin, Pefloxacin and Ciprofloxacin.

Keywords: Antibiotic resistant bacteria, apparently healthy individuals, faecal samples, incidence.