DAY 1

Plenary Sessions

EuroSciCon Conference on

Nanotechnology & Smart Materials

October 04-06, 2018 Amsterdam, Netherlands

DAY 1

October 04, 2018

Sessions

Nano Fluidics | Nanoscience and Technology | Graphene and its Applications | Nano Composites | Nano Medicine | Nano Materials Synthesis and Characterisation | Materials Science and Engineering Physics | Smart Materials and Technologies

Session Chair	Session Co-Chair
Jinping Suo	**Hongwei Zhu**
Huazhong University of Science and Technology China	**Tsinghua University, China**

Session Introduction

Title: **Shape Memory Behavior and Their applications of Bio-based Fibers**
Jinlian Hu, The Hong Kong Polytechnic University, China

Title: **Graphene NEMS technology for extreme sensing and nano thermal engineering**
Hiroshi Mizuta, Japan Advanced Institute of Science and Technology, Japan

Title: **Microtubular nanomembrane devices: From nanophotonics to nanorobotics**
Oliver G Schmidt, IFW Dresden, Germany

Title: **Nanoparticles Tailored High Voltage Insulation Materials**
Jinliang He, Tsinghua University, China

Title: **Novel Perspectives in Nanomedicine: example of engineered nanoparticles for breast cancer therapy**
Macarena Peran, University of Jaen, Spain

Title: **Ultra-sensitive Graphene Sensors for IoT Applications**
Hongwei Zhu, Tsinghua University, China

Title: **Diversification of Nanowire Building Blocks by Post-synthesis Modifications; Monolayer Doping & Self-processing Synthesis**
Roie Yerushalmi, The Hebrew University, Israel

Title: **How to: GMP manufacturing of nanomedicines for clinical trials**
Silvie Meeuwissen, ChemConnection, Netherlands

Title: **Nanotechnology, cementitious nanocomposites and restoration materials**
Styliani Papatzani, University of Brighton, UK

Title: **Printing Nanostructures on Contact Lenses for Wearable Diagnostics**
Haider Butt, University of Birmingham, UK

Title: **Nanostructured sensors for colorectal cancer screening device**
Giulia Zonta, University of Ferrara, Italy

Title: **Bare eye detection based on gold nanoparticles as alternative for traditional analytical methods**
Essy Kouadio Fodjo, Felix Houphouet-Boigny University, Cote dIvoire

Title: **Nanostructured sensors for colorectal cancer screening device**
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Jinlian Hu, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

SHAPE MEMORY BEHAVIOR OF BIO-BASED FIBERS AND THEIR APPLICATIONS

Jinlian Hu
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Natural bio-based fibers consist of a large amount of hydrogen bonds between intra and inter macromolecules that offer a basis for switch required in shape memory behaviors. This work reports our advance in understanding the bio-based fibers with shape memory in keratin hairs, β-sheeted filaments, chitosan and collagen fibers. Qualitative and quantitative study of such fibers was carried out in terms of their structure, shape fixation and recoverability under cyclic deformation programming. The effects of hydration on recovery dynamic mechanical behaviors and structural components were all systematically studied. Hybrid structural network models with switch net points will be presented for interpreting the shape memory mechanism of bio-based fibers. This kind of discoveries of bio-based fibers is surely expected to provide inspiration for exploring other natural materials to reveal their smart functions and making more remarkable synthetic smart materials as well as widening the applications of existing materials

Biography

Jinlian Hu has received her PhD from the University of Manchester in 1994 and then immediately became a Faculty Member of the Hong Kong Polytechnic University. She has achieved international reputation for her insight in conventional and emerging research areas, particularly shape memory polymers and textiles. She has approximately 500 publications including 12 books with 7 related to smart polymers, particularly shape memory polymers. She has about 40 granted patents and wide connections with industries. She is frequently invited Keynote/Plenary Speaker at different conferences. She has received over 50 awards including Distinguished Achievement in Fiber Science from the US-based Fiber Society and the Gold Award, two times on the Advanced Automatic Fabric Appearance Evaluation Systems by National Inventions Exhibition of China and First prize of Sang Ma Trust Fund Textile Science and Technology Award. In 2011, she was awarded the title of China Textile Academic Leader by the China Textile Engineering Society. She is also the recipient of China Elite Talent in 2012.

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H Mizuta et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

GRAPHENE NEMS TECHNOLOGY FOR EXTREME SENSING AND NANO THERMAL ENGINEERING

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An overview is presented for our recent study of novel graphene nano-electro-mechanical (GNEM) devices. We first present GNEM devices for low-power switching and ultra-sensitive chemical gas sensing applications. Three-terminal GNEM switches with heterogeneously stacked graphene/h-BN layers are developed, which achieves low-voltage and sub-thermal switching (S<<60 mV/decade). We then present GNEM chemical gas sensors, which detect either resistance or mass changes due to a small number of gas molecules physisorbed onto suspended graphene at room temperature. With the resistance detection method, we show quantized increments in the temporal resistance, signifying single CO_2 molecule adsorption. As for the mass detection method, we demonstrate the resonance frequency shift of a doubly-clamped graphene resonator with the mass resolution of hundreds zeotpgram (10^{-21} g) order. We also show our recent attempt of patterning single-nanometer-size nanopores in suspended graphene by using state-of-the-art atomic-size focused helium ion beam. Arrays of pores of 3-4 nm in diameter spanning a complete suspended ribbon were successfully patterned with a pitch down to ~14 nm. Thanks to a very high Young's modulus and therefore a high Debye temperature of graphene, the phononic bandgaps are expected to be formed in the bandwidth of a few THz with such single-nanometer pore arrays. This enables us to control thermal transport dominated by heat phonons for relatively low temperature (<200°C). We will discuss the possibility of GNEM-based heat phonon engineering applications

Biography

Hiroshi Mizuta (C Phys FInst P) is currently Distinguished Professor at School of Materials Science, Japan Advanced Institute of Science and Technology (JAIST). He holds a joint appointment, as Visiting Chief Scientist with the Hitachi Cambridge Laboratory. He has a strong research interest in silicon- and graphene-based nanoelectronic devices and nano-electro-mechanical-systems (NEMS) and has led a number of large research projects in the UK and Japan, including PI of the UKRC EPSRC project SISSQIT (2010-2013) on electron spins in Si quantum dots, the EPSRC-JST UK-Japan project NOVTLOS (2011-2014) in which his team developed a new Si-based NEMS nonvolatile switch, and PI of the Japan MEXT grant-in-aid for scientific research projects, Development of Graphene NEMS Hybrid Functional Devices for Autonomous and Ultrasensitive Integrated Sensors (2013-2018) and Single-Nanometer-Scale Graphene Nems Technology for Heat Phonon Engineering (2019- 2023). He has published more than 530 peer-reviewed scientific papers and filed over 50 patents.

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Oliver G Schmidt, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

MICROTUBULAR NANOMEMBRANE DEVICES: FROM NANOPHOTONICS TO NANOROBOTICS

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Microtubular nanomembrane devices (MNDs) with outstanding properties are self-assembled into fully functional and integrative three-dimensional architectures. This makes them attractive for a broad range of applications and scientific research fields ranging from nanoelectronics and photonics to nanorobotics and medicine. MNDs are used to construct ultra-compact and ultra-sensitive advanced electronic circuitry, nanophotonic cavities, sensors and optofluidic components around fluidic channels towards the implementation of a lab-in-a-tube system. They are also useful to study basic mechanisms of single cancer and stem cell migration, growth and mitosis in realistic 3D confined environments. Off-chip applications include biomimetic microelectronics for regenerative cuff implants and the development of hybrid microbiorobotic motors for paradigm shifting reproduction technologies. Cellular cyborg machinery is put forth for novel schemes in targeted drug delivery and cancer treatment

Biography

Prof. Dr. Oliver G. Schmidt is the Director of the Institute for Integrative Nanosciences at the Leibniz IFW Dresden, Germany. His interests bridge across several disciplines, ranging from nanomaterials and nanoelectronics to microfluidics, microrobotics and biomedical applications. He has received several awards: the Otto-Hahn Medal from the Max-Planck-Society in 2000, the Philip-Morris Research Award in 2002, the Carus-Medal from the German Academy of Natural Scientists Leopoldina in 2005, and the International Dresden Barkhausen Award in 2013. Most recently, he was awarded the Gottfried Wilhelm Leibniz-Prize 2018 of the German Research Foundation. The Leibniz-Prize is Germanyâ€™s most important research award and recognizes his outstanding work in the investigation, manufacturing and innovative application of functional nanostructures.

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Jinliang He, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

NANOPARTICLES TAILORED HIGH VOLTAGE INSULATION MATERIALS

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High voltage cables have been widely applied for large-scale power transmission. Polymeric insulation materials have been widely used in electric power systems for their low density, low dielectric strength, ease of processing and most importantly, low cost. As a cable insulation material, the thermal, mechanical, thermo-mechanical and electrical properties should be considered. In this presentation, the effect of various nanoparticles on the electrical properties of insulation polymers is presented. The introduction of nanoparticles can effectively suppress space charge accumulation in polymeric nanocomposites and increase the DC breakdown strength. The interface between nanoparticles and polymer matrix is considered to have an important effect on the properties of nanocomposites, this presentation also introduced the tuning effects of surface-modified nanoparticles on the aggregation structure and trapping property of the nanocomposites, the addition of nanoparticles can suppress the mobility of chain segments in the interfacial region, suppress crystallization and reduce the crystallinity, depending on the surface modification and loading levels of nanoparticles. The strong correlation between traps and the charge transport of nanocomposites and the mechanism of charge transport are discussed, the electrostatic force microscopy tests show that the addition of nanoparticles leads to a decrease in local permittivity, it is found the mobility of local chain segments in the interface suppressed by the nanoparticles can influence the dipolar polarization of chain segments in the interface and eventually results in a decrease in local permittivity

Biography

Jinliang He has received his PhD degree from Tsinghua University, Beijing, China, in 1994. He became a Lecturer in 1994 and an Associate Professor in 1996 in the Department of Electrical Engineering, Tsinghua University. From 2014 to 2015, he was a Visiting Professor in Stanford University. Currently, he is the Chair of the High Voltage Research Institute, Tsinghua University. His research interests include dielectric material, smart sensors and big data application. He is the author of 7 books and 600 technical papers and is an Associate Editors of IEEE Trans on Dielectrics and Electrical Insulation, IEEE Trans. on Power Delivery.

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Macarena Peran et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

NOVEL PERSPECTIVES IN NANOMEDICINE: EXAMPLE OF ENGINEERED NANOPARTICLES FOR BREAST CANCER THERAPY

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[2]GENYO, Parque Tecnológico de Ciencias de la Salud (PTS), Spain
[3]University of Jaén, Spain

The descend of medicine to a nanometer level has led to the development of new diagnostic and treatment strategies. Functionalized nanoscaled materials have been created to be used in the prevention and treatment of various diseases such as neurodegenerative disorders, cancer, atherosclerosis, diabetes and regenerative medicine, including tissue engineering and cell therapy. The incidence of breast cancer is increasing in the developing world and despite advances in cancer molecular profiling there is still no effective cure for some aggressive primary cancers. One of the main approaches of nanotechnology against cancer is the development of nanoparticles that deliver chemotherapy drugs directly to tumour cells. Here we present the generation of an effective, safe and non-toxic nanosystem for use *in vivo* with theranostic application for selective antitumor treatment. The nanodevice was designed to efficiently conjugate therapeutics and diagnostic cargoes based on the use of synthetic nanospheres that were multivalent and tri-functionalized with: a drug; a diagnostic agent and a tumour-specific peptide. *In vivo* evaluation of the nanodevice was conducted using an orthotopic xenotransplant mice model injected with the breast carcinona cell line (MDA MB 231). Treatment reduced tumour size and decreased side effect associated with Doxorubicin without any toxicity signs in treated mice

Biography

Macarena Perán has graduated with a BS in Biology and a MS in Biochemistry and Molecular Biology in 1996 from the University of Málaga, Spain. She moved to the Neuroscience Department at Durham University, UK, where she was awarded with a Marie Curie Fellowship and graduated in 2000 with a PhD. She then completed a Postdoctoral program in the Faculty of Medicine at Granada University. In 2005 and 2006, she was gone to Bath University, UK, and was a short-term Postdoctoral Fellow in Prof David Tosh lab. In 2011 she spent a year as a Visiting Scientist in the Salk Institute for Biological Studies, California in Prof Juan Carlos Izpisua-Belmonte lab. Actually, she is Reader in Anatomy, University of Jaen, and Member of the Scientific Advisory Board at Propanc Health Group Corporation. She has more than 50 peer-reviewed publications in international journals and has participated in more than 20 competitive research projects and has led 7 research contracts within the private sector.

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Hongwei Zhu, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

ULTRA-SENSITIVE GRAPHENE SENSORS FOR IOT APPLICATIONS

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Graphene has the potential for creating thin film devices, owing to its two-dimensionality and structural flatness. Assembling graphene-based building blocks into hybrid structures or composites with diverse targeted structures has attracted considerable interests for understanding its new properties and expanding the potential applications. The integration of graphene into a device always involves its interaction with supporting substrates, making this interaction critical to its real-life applications. This presentation will focus on graphene-on-polymer heterostructure based sensors. We design tiling structures in graphene, composing overlapped graphene plates and realize high sensitivity sensing. By future, combining artificial intelligence with digital signal processing, the graphene based sensing system will represent a new smart tool to classify and analyze signals in fields of vital signs monitoring, displays, robotics, fatigue detection and *in vitro* diagnostics

Biography

Hongwei Zhu has received his BS degree in 1998 and PhD degree in 2003 from Tsinghua University. After completion of his Postdoc studies in Japan and USA, he began his independent career as a Faculty Member at Tsinghua University (2008~present). He is the Vice Dean of School of Materials Science and Engineering. He has authored 3 books and over ten invited book chapters. He has received over 20 patents and published more than 200+ papers in reputed journals.

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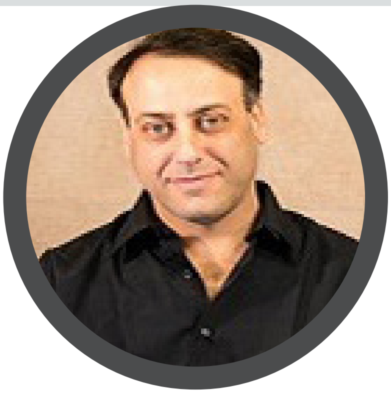
Roie Yerushalmi, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

DIVERSIFICATION OF NANOWIRE BUILDING BLOCKS BY POST-SYNTHESIS MODIFICATIONS; MONOLAYER DOPING AND SELF-PROCESSING SYNTHESIS



Roie Yerushalmi
Institute of Chemistry-The Hebrew University of Jerusalem, Israel

Programmable introduction of heterogeneity at the nanoscale plays a key role in the design of functional building blocks for catalysis, electronic devices, and numerous other applications. Synthetic strategies for attaining well-defined heterogeneity in structure, shape, composition and modulation of the electronic structure at selected regions of the nano system is therefore highly desired. I will present our research towards two methodologies for post-synthesis modification and symmetry breaking of semiconducting nanostructures using nanowires as the basic building blocks covering two aspects of post-synthesis modification of nanowires: (I) *Ex-situ* doping of silicon nanowires. *Ex-situ* doping enables the transformation of un-doped silicon nanowires into heterogeneously doped building blocks featuring sharp p-i-n junctions across the nanowire. Relying on surface chemistry provides an accurate dose and initial positioning together with fine control over the diffusion processes. The monolayer doping methodologies are valuable for decoupling the doping step from the nanowire synthesis step, resulting in *ex-situ* doping. (II) Self-processing synthesis of coinage metal-semiconductor hybrid structures. The hybrid nanostructures obtained for the coinage metals resemble the morphology of grass flowers, termed Nano-floret hybrid nanostructures consisting of a high aspect ratio SiGe nanowire (NW) with a metallic nanoshell cap. The new class of structures is useful in a variety of applications owing to the unique geometrical aspect ratio and electronic properties of the hybrid systems. The synthesis involves a sequence of selective etch and deposition steps which are self-initiated and self-terminated resulting in the hybrid nanostructures

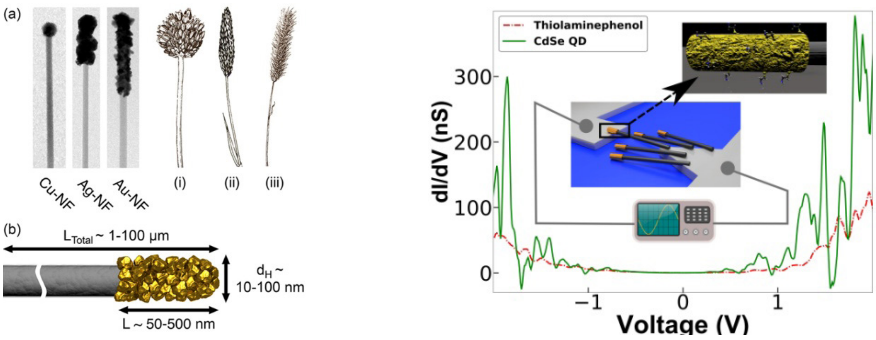


Figure 1: Nanoflora, hybrid nanostructures based on nanowire building blocks used for sensing.

Biography

Roie Yerushalmi has received his PhD in Chemistry from the Weizmann institute of science, Israel, in 2005 (awarded the Kennedy prize for outstanding PhD work). He pursued Postdoc in the field of Nanoscience in the lab of Prof Ali Javey at UC Berkeley from 2006-2008. In 2008, he joined the Institute Of Chemistry at the Hebrew University of Jerusalem, Israel. He is serving as an Associate Professor at the Hebrew University of Jerusalem, since 2015. His main research interests include development of new surface chemistries, atomic and molecular layer deposition, nanowire synthesis methodologies, hybrid nanostructures, ex-situ doping of nanostructures, nanostructure array assembly, and comprehensive characterization of complex nanostructured systems by application of analytical methods. Design and synthesis of hybrid nanostructures for photocatalysis, electrical and optical applications, energy harvesting. He has received a starting grant from the ERC (European Research Council), the Krill Prize, Kennedy prize, and the career development award by the Human Frontier Science Program.

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Silvie A Meeuwissen, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

GMP MANUFACTURING OF NANOMEDICINES FOR CLINICAL TRIALS

Silvie A Meeuwissen
Ardena-ChemConnection B V, The Netherlands

Nanomedicine, the convergence between nanotechnology and medical application, is a hot field. Many research groups all around the world focus their efforts on the invention of potential new nanomaterials that can contribute to improved health care. The nanoscale physical properties of these particles afford a unique potential for biomedical application in the treatment of e.g. cancer, brain, inflammatory and immune diseases. Despite their great potential, the far majority of all discovered nanomedicines are still at the research stage. To bring the discovery from laboratory bench to patient bedside requires a whole different discipline: pharmaceutical development. This presentation will give the audience a sneak peek of what it takes to navigate a potential nanomedicine through the world of drug development. Special attention will be given to the translation from lab experiments to production of nanomedicine intended for use in humans

Biography

Silvie A Meeuwissen has received a PhD in Bioorganic Chemistry from Radboud University in Nijmegen, under the supervision of Prof Jan van Hest in 2013. Her research is focussed on polymer chemistry and the creation, analysis and application of nanocarriers. She worked on a Postdoctoral project at Future Chemistry in cooperation with the Synthetic Organic Chemistry Group of Prof Floris Rutjes (RU Nijmegen), before she started as a Researcher at ChemConnection in 2014. ChemConnection, part of the Ardena group, is a contractor for all chemical, pharmaceutical and bioanalytical needs that arise in the clinical supply chain from lab to patient. Currently, she is working as a Principal Scientist and manages several projects, focusing on process development and GMP manufacture of novel nanomedicine candidates for preclinical trials.

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Nanotechnology & Smart Materials

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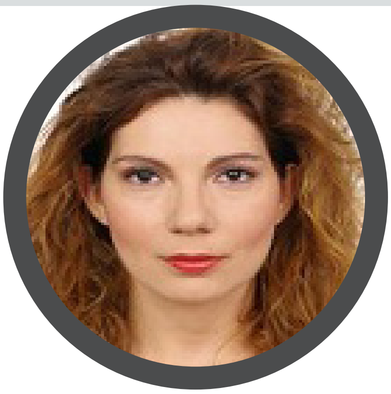
Styliani Papatzani, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

NANOTECHNOLOGY: CEMENTITIOUS NANOCOMPOSITES AND RESTORATION MATERIALS



Styliani Papatzani

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[2]University of Brighton, England

Nanotechnology continuously reshapes our world, redefines and enriches knowledge, while opening new horizons. Tailored construction materials have become a reality and characterization techniques relating to all scales (nano-micro-macro) are being correlated. But what can nanotechnology offer in cement science and how can we best utilize the available resources and expand them? This talk provides an overview of the speaker's latest achievements in the field of cement science with the addition of specific nanoparticles. Silicon dioxide and montmorillonite nanoparticles are scrutinized, new theories and methodologies on how the dispersion medium and nanostructure of the particles can affect the performance and characteristics of composite cement formulations are discussed. In light of the E U regulations on limiting the CO_2 emissions mainly caused by the production of Portland cement clinker (PC), the research carried out breaks the allowable minimum limits of PC addition in composite cement formulations. The permissible maximum limits of additions such as fly ash, limestone and/or silica fume according to EN 197-1:2011 are also broken by adding nanoparticles. This breakthrough is allowing a twofold advantage in embodied CO_2 emissions reduction and further financial savings. Denser microstructure, stronger and more durable cementitious products are rendered possible. How can we best monitor these changes? Of the various characterization techniques available, which can be directly correlated? On top of all, what are the levels of confidence with respect to the nanoparticles addition? Which are the controlling parameters and how can we ascertain the benefit? In addition, could specific nanoparticles be suitable for the structural restoration of historical listed monuments? All the above questions will be answered through selected series of comparative results showing the enhancements offered by the addition of the nanoparticles and the difficulties encountered. The talk will be concluded with ideas on further research

Biography

Styliani Papatzani has completed three Master courses [Imperial College and National Technical University of Athens (NTUA)] with awards and distinctions. She has worked in industry carrying out structural design of new buildings and structural assessments of existing buildings and monuments, then completed a PhD on the effect of various nanoparticles in cement formulations from the University of Bath, UK and Postdoctoral studies at the NTUA. She is currently a Senior Engineer at the Hellenic Ministry of Culture, Greece and a Lecturer at the University of Brighton, UK. She has published more than 25 papers in reputed journals, book chapters and conferences and has been serving as a Consultant and Technical Expert in a number of professional committees.

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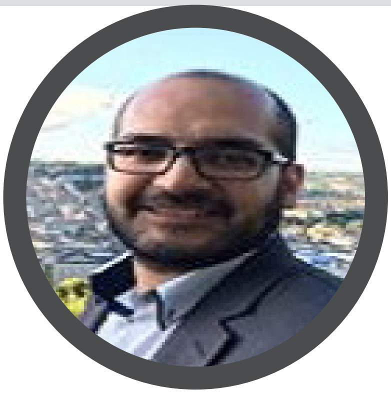
Haider Butt, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

PRINTING NANOSTRUCTURES ON CONTACT LENSES FOR WEARABLE DIAGNOSTICS

Haider Butt
University of Birmingham, UK



The key challenge for producing nanostructures based commercial healthcare applications is the scaling up of the fabrication process. We present the fabrication of dye based nanostructures by using the fast and commercially viable method of holographic laser ablation. In this method, we use a single beam of a nanosecond laser, which after reflecting from a mirror self-interferes. This results in an interference pattern which can be used to ablate well-ordered gratings in thin films. The period of the grating is determined by the incident wavelength (λ) and tilt angle (θ) of the sample with respect to normal incidence. In this manner, we recorded various holographic nanopatterns onto transparent substrates, such as glasses and commercial contact lenses (Fig. 1). Using this quick, scale and economical method we produced several wearable contact lens sensors. These contact lens based holographic sensors can be used for monitoring the eye curvature and pressure of glaucoma patients. The holograms can also be functionalized to sense glucose concentrations in the tears of diabetic patients. The findings have been reported in highly reputable journals and have also received a lot of media attention. The approach was also extended into 3D patterning by ablating 3D assemblies of Ag nanoparticles within polymer media. Through laser ablation, ordered 3D geometries/patterns were written within the polymer layers. These reconfigurable geometries act as holographically recorded optical devices

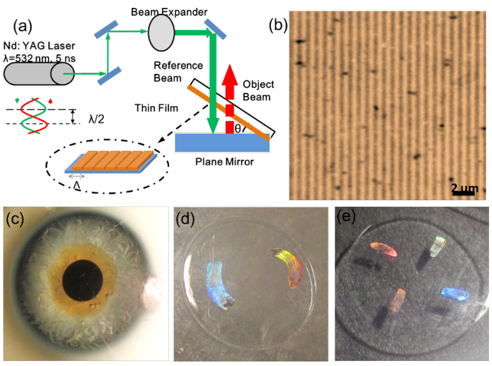


Figure 1: (a) Holographic laser ablation process, (b) the nonpatterns produced, (c-e) holograms printed on commercial contact lenses

Biography

Haider Butt is serving as a Senior Lecturer at the University of Birmingham, UK, where he is leading a Nanophotonics group with particular interests in healthcare technologies. Previously, he was a Henslow Research Fellow at the University of Cambridge, from where he also received his PhD in April 2012. He has published over 100 papers in various peer-reviewed journals and has around 40 conference publications. His research work has received substantial recognition in the form of awards and media interviews. He has secured several prestigious research awards including Philip Leverhulme Prize.

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EuroSciCon

DAY 1

Workshop

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Cristina Elizetxea et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

NANOTECHNOLOGY BASED SOLUTIONS FOR ENHANCED PRODUCTS AND PROCESSES IN EXISTING INDUSTRIAL MANUFACTURING PLANTS

Cristina Elizetxea[1], Maider García de Cortázar[1], Ane Irazustabarrena[1], Pedro Egizabal[1], Maria Parco[1], Isella Vicini[2], Elena Melotti[2], Mario Ordóñez[3], Alicia Johansson[4], Riccardo Borghini[5], Angel Hernán[6] , Nagore García[7]

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[2]Warrant Group S.r.l. – Gruppo Tecnoinvestimenti, Italy
[3]MAIER Technology Centre, Spain
[4]NIL Technology ApS, Denmark
[5]Bonfiglioli Riduttori, Italy
[6] SISTEPLANT, Spain
[7] SEMATEC, Spain

Introduction: **Key Enabling Technologies (KETs) provide the basis for innovation in a range of products across all industrial sectors. However, one of the major weaknesses of Europe with regards to them lies in the difficulty of translating its knowledge base into marketable goods and services. IZADI-NANO2INDUSTRY Project takes this challenge and, proposing different solutions based on KETs such as nanotechnology, advanced materials and manufacturing, contributes to overcome the barriers that nano-materials are facing to get introduced in the market.**

Methods: **conventional materials and injection moulding, casting and coating manufacturing processes are improved by nanotechnology and combined in three innovative PILOTS at different existing production plants:**

TRIBONANO Pilot: **nanostructured powders for metallic cermet coatings and thermal spray technology for solid state deposition**

HARDCAST Pilot: **nano-reinforcements added and dispersed via master-pellets in a new, low cost and safe gravity casting process**

ESTCRATCH Pilot: **nanoreinforced thermoplastic based on masterbatches and inserts with nanotextured surfaces for injection moulds.**

Results: **new performance-enhanced components for the construction and agricultural machinery sector and the automotive one are produced at industrial scale, reaching**

TRIBONANO Pilot: **nanostructured coatings with improved ductility, toughness and sinterability, increased strength and resistance; metallic parts (valve plate of hydraulic motor) with increased mechanical efficiency; subsequent reduction of fuel consumption and $CO2$ emissions.**

HARDCAST Pilot: **nano-added material with 30% increased tensile properties maintaining ductility in comparison with standard ductile cast iron one; possibility for lightweight concepts and subsequent consumption/emission reduction; reduction of the component (swash plate of hydraulic motor) production phases and of the related costs**

ESTCRATCH Pilot: **PMMA with improved scratch resistance more than 140% compared to standard one, low colour variation of the material; reduction of parts' (b-pillar) production phases and costs, greener manufacturing process, improved recyclability of the parts.**

Discussion: **Proposing technological solutions with minimum necessary changes to existing production lines and able to reduce production phases and costs can improve the acceptance of KETs by the industrial sector, so overcoming that innovation gap identified as the European 'Valley of Death'**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 686165

DAY 1

Scientific Tracks & Abstracts

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DOI: 10.21767/2471-9838-C6-024

NANOSTRUCTURED SENSORS FOR COLORECTAL CANCER SCREENING DEVICE

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[1]University of Ferrara, Italy
[2]SCENT S r l, Italy

Among the major goals of medicine, there is the preventive screening of tumours in order to prevent their degeneration. Colorectal cancer (CRC) shows a curability rate up to 90%, if identified at stage I. The work presented here started in 2013 with the reproduction of an artificial intestine inside a laboratory set-up, in order to find the best sensor array capable of recognizing CRC-gaseous biomarkers produced by tumour cells inside a mixture of intestinal interferers. After that, the approach changed, moving towards the analysis of fecal exhalations. After a feasibility study, that lead to the foundation of the start-up SCENT in 2015, the most efficient sensors combination was chosen. This study was conducted in collaboration with Hospital S Anna of Ferrara that provided the stool samples of people affected by CRC during surgery. Controls were healthy volunteers. This passage was fundamental to proof the recognition capability of sensors inside a portable device (SCENT A1), patented in Europe, and composed of a core of five nanostructured sensors, a pneumatic system and a specific electronics. After having obtained the acceptance by the ethics committee, a clinical validation protocol started in May 2016, to demonstrate the capability of SCENT A1 of identifying the difference between fecal exhalation of healthy and CRC-affected subjects. The protocol will end in 2019 and involves the Hospital S Anna and AUSL of Ferrara and Ospedale del Delta of Lagosanto. The tests are compared to the results of fecal occult blood test (FOBT) using colonoscopy as a gold standard. A specific algorithm of analysis has been realized for data classification. On 100 comparisons, the method correctly classified the 90% of healthy subjects, the 100% of CRC-affected and the 57% of low risk adenomas. If combined with FOBT, our test will considerably improve specificity, eliminating a huge number of non-operative colonoscopies

Biography

Giulia Zonta has completed her PhD in Matter Physics in Apr' 2017 at the University of Ferrara. She is now working as a Postdoctoral Fellow at the Department of Physics and Earth Sciences, working with the Sensors Laboratory team, coordinated by Prof Cesare Malagù. She is the Sales Executive and Co-Founder of the start-up SCENT S r l, with the aim of realizing prototypes for tumour preventive screening and monitoring. She has published on reputed international journals and also a Reviewer. She is an Assistant in General Physic course..

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October 04-06, 2018
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Essy Kouadio Fodjo et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

BARE EYE DETECTION BASED ON GOLD NANOPARTICLES AS AN ALTERNATIVE FOR TRADITIONAL ANALYTICAL METHODS

Essy Kouadio Fodjo[1], Cong Kong[2] and Koffi Mouroufie Gabriel[3]

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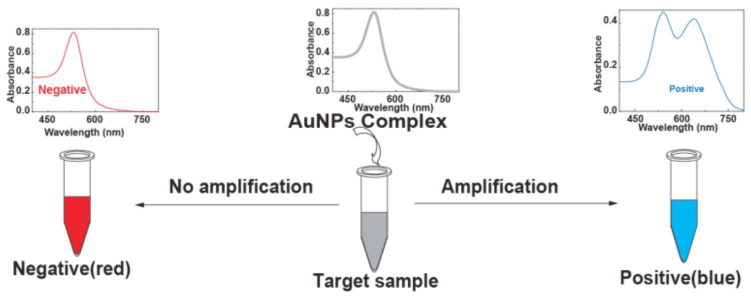
[2]East China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, PR China
[3]Laboratoire des Procédés Industriel et de Synthèse de L'Environnement-INPHB, Republic of Cote d'Ivoire

Since the traditional analytical techniques are costly and need trained staff, research is focused on the development of easy analytical methods in order to overcome the increase in needs especially in food security. For this purpose, there are several reports aiming to improve these methods or explore novel strategies for its product detection. Gold nanoparticles (AuNPs) can be functionalized with biology compounds (streptavidin, avidin-AuNPs for instance), and designed to signal for a selective contaminant detection. Most of these complexes can cause clusterization of biology compound-AuNPs and leads to a color change of the solution from red to blue (Figure 1). This visual detection scheme which does not require any fluorescent reagents and detection instruments can hold promise in point of care and food testing, particularly in resource-limited regions



Biography

Essy Kouadio Fodjo has received his PhD degree (2013) in Analytical Chemistry under the supervision of Prof Yitao Long from East China University of Science and Technology (Shanghai, China). After completion of PhD, he has been awarded as Visiting Scientist in Analytical Chemistry based on Nanotechnology at Abdullah Gull University by TUBITAK (Turkey). He acts as Project Leader supported by Third World Academy of Sciences (TWAS) for the project entitled Selective-Size synthesis of Silver Nanomaterials AgAux (Fe∏O∏)y, under the Research Grant N° 16-510 RG/CHE/AF/AC_G–FR3240293301. His research is mainly focused on Analytical Chemistry based on Nanotechnology, whose background is built after years of experience in research, evaluation and teaching both in study tours and education institution (Felix Houphouet-Boigny University). He has published more than 20 papers in reputed journals such as *Journal of Materials Chemistry, Materials Chemistry and Physics and Applied Surface Science.*

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EuroSciCon

DAY 2

Keynote Forum

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October 04-06, 2018
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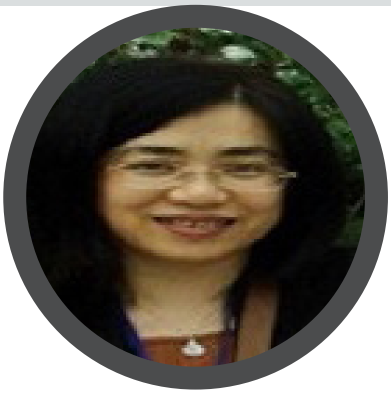
Yongmei Zheng, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-023

BIOINSPIRED WETTABILITY SURFACES: DEVELOPMENT IN MICRO- AND NANOSTRUCTURES



Yongmei Zheng
Beihang University (BUAA), P R China

Biological surfaces create the enigmatical reality to be contributed to learning of human beings. They run cooperate between of endlessly arranged various-style gradient micro- and nanostructures (MN) that greatly provide with excellent functions via natural evolvement. Such biological surfaces with multi-gradient micro- and nanostructures display unique wetting functions in nature, which have inspired researchers to design originality of materials for promising future. In nature, a combination of multiple gradients in a periodic spindle-knot structure take on surface of spider silk after wet-rebuilding process in mist. This structure drives tiny water droplets directionally toward the spindle-knots for highly efficient water collection. Inspired by the roles of gradient MNs in the water collecting ability of spider silk, a series of functional fibers with unique wettability has been designed by various improved techniques such as dip-coating, fluid-coating, to combine the Rayleigh instability theory. The geometrically-engineered thin fibers display a strong water capturing ability than previously thought. The bead-on-string heterostructured fibers are capable of intelligently responding to environmental changes in humidity. Also a long-range gradient-step spindle-knotted fiber can be driven droplet directionally in a long range. An electrospun fiber at micro-level can be fabricated by the self-assembly wet-rebuilt process, thus the fiber displays strong hanging-droplet ability. The temperature or photo or roughness-responsive fibers can achieve a controlling on droplet driving in directions, which contribute to water collection in efficiency. Besides, inspired by gradient effects on butterfly wing and lotus leaves, the surfaces with ratchet MN, flexible lotus-like MN are fabricated successfully by improved methods, which demonstrate that the gradient MN effect rises up distinctly anti-icing, ice-phobic and de-ice abilities. These multifunctional materials can be designed and fabricated for promising applications such as water-collecting, anti-icing, anti-frosting, or anti-fogging properties for practical applications in aerospace, industry and so on.

Biography

Yongmei Zheng (PhD) is currently serving as a Professor at School of Chemistry, Beihang University. Her research interests are focused on bioinspired surfaces with gradient micro- and nanostructures to control dynamic wettability and develop the surfaces with characteristics of water repellency, anti-icing, anti-frosting or fog-harvesting, tiny droplet transport, water collection and so on. She has published more than 90 SCI papers in journals including Nature, *Adv Mater, Angew Chem Int Ed, ACS Nano, Adv Funct Mater*, etc., with 12 cover stories and a book entitiled as "*Bioinspired Wettability Surfaces: development in Micro- and Nanostructures*" by Pan Standard Publishing, USA. Her work as a Scientist was highlighted on News of Royal Society of Chemistry, Chemistry World in 2014. She is a Member of Chinese Society of Composite Materials (CSCM), Chinese Chemistry Society (CCS), American Chemistry Society (ACS), International Society of Bionic Engineering (ISBE), and International Association of Advanced Materials (IAAM). She won an ISBE outstanding contribution award in 2016, by ISBE and an IAAM Medal in 2016, by IAAM in Sweden.

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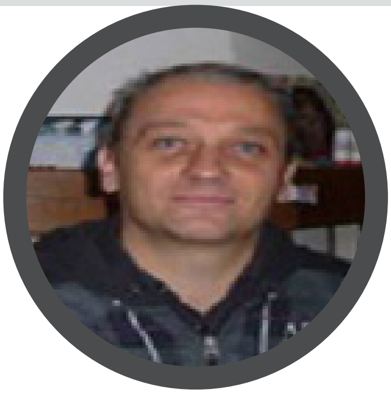
D Bellet et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-023



NANOMATERIALS FOR TRANSPARENT ELECTRODES: PROPERTIES, CHALLENGES AND PROSPECTS

D Bellet[1], T Sannicolo[1], D T Papanastasiou[1], V H Nguyen[1,2], J Resende[1], S Aghazadehchors[1,3], C Jimenez[1], D Munoz-Rojas[1] and D N Nguyen3

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[2]CEA-INES, Liten, France
[3]Universite de Liege, CESAM/Q-MAT, SPIN, Belgium

The past few years have seen a considerable amount of research devoted to nanostructured transparent conductive materials which play a pivotal role in many modern devices such as: solar cells, flexible light-emitting devices, touch screens, electromagnetic devices or flexible transparent thin film heaters. Currently, the most commonly used material for such applications (ITO: Tin-doped Indium oxide) suffers from two major drawbacks: indium scarcity and brittleness. Among emerging transparent electrodes, silver nanowire (AgNW) networks appear as a promising substitute to ITO, since these percolating networks exhibit excellent properties with sheet resistance of a few Ω/sq and optical transparency of 90%, fulfilling the requirements for many applications. It also shows very good electro-mechanical properties. Their main properties, the influence of post treatments or the network density and nanowire size but as well their stability will be discussed, thanks to both experimental and numerical approaches. Some applications will be developed such as their use as transparent heaters or in solar cells. As well, other indium-free transparent conductive oxide (TCO) layers have being investigated and some exhibit interesting properties. We will present the main scientific challenges associated to their physical properties. For instance the electron mobility in highly doped Al-ZnO or F-SnO_2 will be discussed as well the capability to control the haziness of such transparent electrodes. We will show as well that recently some developments of easily up-scalable and vacuum-free deposition techniques such as atmospheric pressure spatial atomic layer deposition (AP-SALD) appear promising for developing high-quality materials with a high throughput at low temperature (≤200°C), thus being compatible with polymeric substrates and roll-to-roll processing. This contribution aims at presenting briefly the main properties of transparent electrodes as well as the challenges which still remain in terms of efficient integration in devices.

Biography

Daniel Bellet has became an Assistant Professor at Grenoble University in 1990 and is Professor at Grenoble Institute of Technology (Grenoble INP) since 1998. He was Junior Member at IUF (Institution for promoting excellence in French Universities) from 1999 to 2004, and was Director of the academic research community 'Energies' at the Région Auvergne-Rhone-Alpes between 2011 and 2017. His research is focused on material physics and more specifically now on transparent conductive materials and he is a Co-Author of more than 140 peer-reviewed publications or proceedings, 8 book chapters and has an h-index of 33.

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Rafal Kozubski et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-023

VACANCY MEDIATED SELF- AND INTER-DIFFUSION IN INTERMETALLICS: KINETIC MONTE CARLO SIMULATION

Rafal Kozubski[1], J Betlej[1], P Sowa[1], G E Murch[2] and I V Belova[2]
[1]Marian Smoluchowski Institute of Physics, Jagiellonian University, Poland
[2]Centre for Mass and Thermal Transport in Engineering Materials, The University of Newcastle, Australia

Methodology of the Monte Carlo simulation of vacancy mediated self- and inter-diffusion is presented and illustrated by the results obtained in the case B2 ordering triple-defect binary intermetallics. The kinetic Monte Carlo (KMC) algorithm was implemented with local configuration dependent migration barriers and temperature dependent equilibrium vacancy concentration determined by means of semi grand canonical Monte Carlo (SGCMC) simulations. The inversion of the relationship between the Ni and Al-diffusivities in Al-rich Ni-Al systems deduced from the features of experimentally investigated interdiffusion in Ni-Al was perfectly reproduced by direct self-diffusion simulations. The origin of the phenomenon was elucidated in terms of an increase of the NNN Al jump frequency caused by the generation of structural Ni-vacancies. KMC simulations of diffusion couple experiment were performed by incorporating physical model of vacancy source and sinks and assuming that equilibrium vacancy concentration in the system is achieved much faster than the equilibrium atomic configuration. Semi grand canonical Monte Carlo (SGCMC) algorithm implemented in the KMC code generated on-line vacancy concentrations locally equilibrated according to the virtual atomic configuration in the sample. The evaluated interdiffusion coefficients, as well as the correlation and Kirkendal effects resulting from the simulation of Ising type models of binary disordered and ordered systems were analyzed.

Biography

Rafal Kozubski has completed his PhD from the Jagiellonian University in Kraków in 1984. He was serving as a Postdoctoral Fellow at the Strasbourg Institute of Physics and Chemistry of Materials (IPCMS), France from 1987 to 1988. He has served as a Lise-Meitner Fellow, the Institute for Solid State Physics, University of Vienna, Austria from Oct' 1993 to Sep' 1995.. In 2006, he was appointed as a Full Professor in the Jagiellonian University in Kraków, Poland. His international experience includes International Fellowship at the Queen's University in Belfast (2006-2008) and Visiting Professorships at the L Pasteur University in Strasbourg/University of Strasbourg, France (2007-2011). In 2016, he was appointed as a Conjoint Professor of the University of Newcastle, Australia. He has published over 100 scientific papers in international reviewed journals and is an Author of over 150 communications on international conferences.

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Hala Gali-Muhtasib, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-023

THYMOQUINONE-BASED NANOFORMULATIONS FOR CANCER TREATMENT

Hala Gali-Muhtasib
American University of Beirut, Lebanese Republic

Cancer is the second leading cause of mortality worldwide. The acquired resistance of chemotherapy necessitates using new approaches for anticancer drug discovery. There is growing interest in using plants as a source of anticancer agents due to their minimal toxicity to normal cells. Non-specific drug targeting and the many challenges faced by anticancer drug delivery have been overcome by nano formulations of these drugs. Thymoquinone has been shown to inhibit cancer progression selectively in many cancer systems both *in vitro* and in vivo. Despite the promising anticancer properties of TQ, its clinical translation is halted by its hydrophobicity, poor bioavailability, limited solubility and high binding capacity to plasma proteins. This can prevent TQ from reaching its targeted tumor sites. Several (TQ-NP) formulations have been shown to have enhanced anticancer activities in comparison to free TQ. We have recently described a novel TQ formulation that has improved activity over free TQ in breast cancer cell lines. The efficacy of the TQ-NP formulation depended on the time for drug uptake, drug concentrations, route of entry and trafficking and cellular interactions. In this presentation, I will focus on the different nanoparticle formulations of the anticancer compound Thymoquinone (TQ-NP) derived from black seed. I will discuss the characteristics and applications of these TQ-NP formulations and highlight the successes and limitations for developing biologically relevant models.

Biography

Hala Muhtasib is Professor of Cell Biology at the American University of Beirut. She received her PhD from Kansas State University, USA in 1990. Her research interests are in cancer chemotherapy and anticancer mechanisms of plant-derived compounds. She has over 90 publications in peer-reviewed journals and is the recipient of four research achievement awards.

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EuroSciCon

DAY 2

Plenary Sessions

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DAY 2

October 05, 2018

Sessions

Advanced Nanomaterials | Nano Medicine | Nanotech for Energy and Environment | Nano Composites | Nanoscience and Technology | Nanotechnology in Agriculture and Food Industry | Material science and Engineering Physics | Materials for Energy and Environmental Sustainability | Physics and Chemistry of Materials | Emerging Smart Materials | Nanomaterials and Nanotechnology | Smart Biomaterials and Medical Devices | Market Demand and Value | Mechanics, Characterization Techniques and Equipments

Session Chair
Alojz Ivankovic
University College Dublin, Ireland

Session Co-Chair
Jaehwan Kim
Inha University, South Korea

Session Introduction

Title: **The Quasi-Solid State Single-Atom Transistor: Perspectives for Quantum Electronics at Room Temperature**
Thomas Schimmel, Karlsruhe Institute of Technology, Germany

Title: **Effect of different nitride nano-particles on the hydrogen permeability of N-ODS steel**
Jinping Suo, Huazhong University of Science and Technology, China

Title: **Cellulose based Smart Materials for Future Technology**
Jaehwan Kim, Inha University, South Korea

Title: **Bulk Nanostructured Materials produces by severe plastic deformation – science and applications**
Daria Setman, University of Vienna, Austria

Title: **Tomographic and chemical analysis of the lipid vesicles inside bacteria for biofuel production by a new multi-frequency UA-AFM-IR platform**
Eric Lesniewska, University of Bourgogne, France

Title: **Nanostructured catalysts for CO2 reduction**
Angelica Chiodoni, Istituto Italiano Di Tecnologia, Italy

Title: **Selective Laser Processing of Metal Nanomaterials for Flexible and Stretchable Electronics Applications**
Seung Hwan Ko, Seoul National University, South Korea

Title: **Thin and ultrathin protective coatings – multifunctional and industrial**
Vaino Sammelselg, University of Tartu, Estonia

Title: **Tailoring the properties of structural adhesives and fibre reinforced plastics using nano-additives**
Alojz Ivankovic, University College Dublin, Ireland

Title: **Implementation of an Analytical Methodology to Assess the Fraction of TiO2 Nanoparticles in Food Additive E171 by EM and SP-ICP-MS**
Eveline Verleysen, Sciensano Research Institute, Belgium

Title: **Nanodielectrics for High-Temperature Film Capacitors**
Qi Li, Tsinghua University, China

Title: **Glucose Sensor Using Microwave Sensing Technique**
Poonam Agarwal, Jawaharlal Nehru University, India

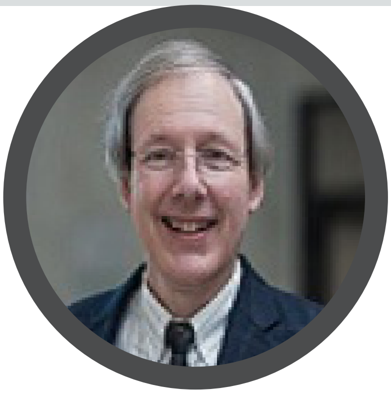
Title: **Mixed monolayer and PEG Linker Functionalised Gold Nanoparticles**
Dorian Dixon, Ulster University, Ireland

Title: **Deep Learning for MEMS**
Ankit Agarwal, Mobileum India Private Ltd., India

Thomas Schimmel, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

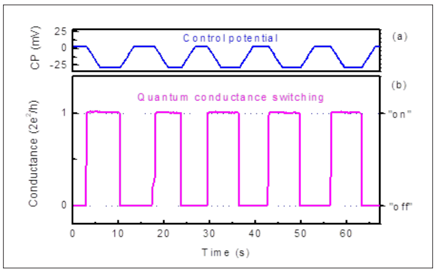
THE QUASI-SOLID STATE SINGLE-ATOM TRANSISTOR: PERSPECTIVES FOR QUANTUM ELECTRONICS AT ROOM TEMPERATURE

Thomas Schimmel
Karlsruhe Institute of Technology (KIT), Germany



A quasi-solid state atomic-scale quantum conductance switch is demonstrated which allows to open and close an electrical circuit by the controlled and reproducible reconfiguration of individual silver atoms within an atomic-scale junction. The only movable parts of the switch are the contacting atoms. The device which is fabricated by electrochemical deposition of silver atoms within a gel electrolyte is entirely controlled by an external voltage applied to an independent third gate electrode. Controlled switching was performed between a quantized, electrically conducting "on-state" exhibiting a conductance of G0 = $2e^2/h$ (≈ 1/12.9kΩ) or pre-selectable multiples of this value and an insulating "off-state". The device, which reproducibly operates at room temperature, represents an atomic transistor or relay, opening intriguing perspectives for the emerging fields of quantum electronics and logics on the atomic scale.

Image



F Xie, A Peukert, Th Bender, Ch Obermair, F Wertz, Ph Schmieder and Th Schimmel (2018) Quasi-Solid-State Single-Atom Transistor, Advanced Materials, in press.

Biography

Prof. Dr. Thomas Schimmel holds a doctorate in physics from the University of Bayreuth. So far he had professorships at universities in Munich and Linz. Since 1996 he teaches at the Institute of Applied Physics of Karlsruhe University, Karlsruhe Institute of Technology (KIT), and participates in numerous research projects. He is the initiator and spokesman of the research network "Functional Nanostructures" in Baden-WÃ¼rttemberg. Professor Schimmel is head of the working group for nanostructuring and scanning probe technology.

EuroSciCon Conference on
Nanotechnology & Smart Materials

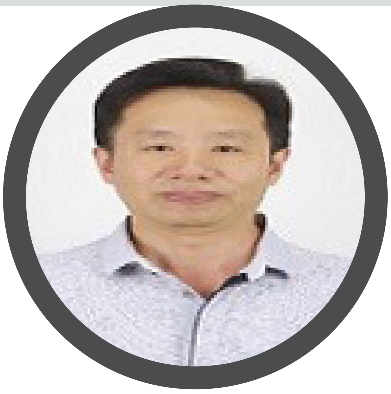
October 04-06, 2018
Amsterdam, Netherlands

Jinping Suo et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

EFFECT OF DIFFERENT NITRIDE NANO-PARTICLES ON THE HYDROGEN PERMEABILITY OF N-ODS STEEL

Jinping Suo, Ying Zhang and Juexin Xu
State Key Laboratory of Mould Technology-HUST, PR China

ODS steel is one of the most potential materials for TBM (test blanket module) structural application. But it faces the issues of brittle at room temperature and tritium permeation. In this work, different content of N (in CrN, TiN and VN form) was added in the matrix powder to develop a new type of ODS steel (N-ODS steel), improve the toughness and hydrogen (deuterium, tritium) permeation resistance property. The effect of different content and kind of nitride nano-particles on the hydrogen permeability of N-ODS steel was studied. The N-ODS powder were fabricated by mechanical alloying, followed with reduction in hydrogen, and then sintered by spark plasma sintering at 1050°C for 10 min. After sintering, all the specimens were normalized at 1050°C for 0.5h, and then furnace cooled to room temperature. The TEM image showed that N-ODS steel is nanostructure and due to addition of N, nanoscale particles of CrN (TiN, VN) and some nuclear/shell structural precipitates were formed in the N-ODS steel. Electrochemical hydrogen permeation technique was used to evaluate the hydrogen permeability of N-ODS steel. The results reveal that the hydrogen diffusion coefficient decreased with the increasing of content of N (in CrN form). Besides, different N sources (CrN, TiN, VN) also have significant effects. The hydrogen diffusion coefficient of N-ODS steel with 1% TiN was only half of diffusion coefficient of steel with 1% CrN and steel with 1% VN. When the content of TiN increased, the hydrogen diffusivity decreased further. The N-ODS steel with N in TiN form exhibits the best hydrogen resistance property.



Biography

Jinping Suo has completed his PhD at 2000 from Beijing Iron and steel General Institute of Material Science. He is a Professor of Material Science at Huazhong University of Science and Technology. He focuses on research of structural materials, tritium resistance coatings and so on. He has published more than 50 papers on *Corrosion Science, Journal of Nuclear Materials, Surface* and *Coatings Technology* and other journals, and also got several patents.

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EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

Jaehwan Kim et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

CELLULOSE BASED SMART MATERIALS FOR FUTURE TECHNOLOGY

Jaehwan Kim, Hyun Chan Kim, Jung Woong Kim, Ruth M Muthoka and Qin Yu Zhu
Creative Research Center for Nanocellulose Future Composites, Inha University, South Korea

Renewable materials maintain our resources from the environment, which we can overcome degradation of natural environmental services and diminished productivity. Cellulose is one of the nature's most abundant natural polymers, the main chemical components of wood and plants. It is a renewable material that recycles to nature by composting with short period of time. The use of renewable materials is essential in future technologies. This presentation reviews recent advancement of cellulose for smart materials, including cellulose and its sensors, actuators, energy storage and space structure applications. To further improve functionality of renewable materials, hybrid composites of inorganic functional materials are introduced by incorporating carbon nanotubes, titanium dioxide and tin oxide conducting polymers and ionic liquids. Since renewable materials have many advantages of biocompatible, sustainable, biodegradable, high mechanical strength and versatile modification behaviours, more research efforts are necessary on the development of renewable smart materials.

Biography

Jaehwan Kim has joined the Department of Mechanical Engineering at Inha University, Korea in 1996, where he served as Inha Fellow Professor. He is a fellow of The Korean Academy of Science and Technology, National Academy of Engineering of Korea, and Institute of Physics. He is an Associate Editor of *Smart Materials and Structure* and Editor of International *Journal of Precision Manufacturing and Engineering*. He has been the Director of Creative Research Center for EAPap actuator funded by National Research Foundation of Korea (NRF). Recently, he started another Creative Research Center for nanocellulose future composites, sponsored by NRF. He has first discovered cellulose as a smart material, which can be used for sensors, actuators and electronic materials. His research interests include smart materials, structures and devices, renewable smart materials, cellulose, electroactive polymers, power harvesting and flexible electronics. He has published more than 270 prestigious journal papers, 310 international conference papers, more than 40 patents.

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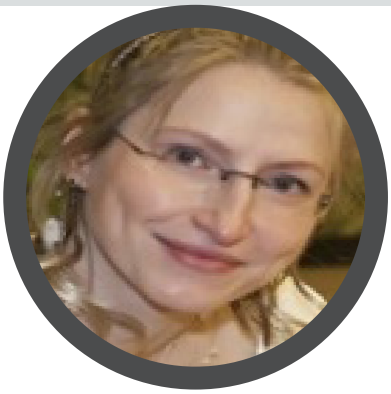
Daria Setman, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

BULK NANOSTRUCTURED MATERIALS PRODUCES BY SEVERE PLASTIC DEFORMATION: SCIENCE AND APPLICATIONS



Daria Setman
University of Vienna, Austria

Bulk nanostructured materials produced by severe plastic deformation (SPD) are materials with nanostructured features, such as nanograins, nonoclusters or nanotwins. These nonstructured materials are fully dense and contamination free and in many cases they have superior mechanical and functional properties. Due to the high hydrostatic pressure during plastic deformation, also very brittle materials can be deformed to infinite deformation degrees. These highly deformed materials have shown highlights in mechanical properties i.e. high strength paired with considerable ductility, as well as superplasticity at high deformation rates, recent research activities increasingly present outstanding SPD functional nanomaterials. Those exhibit advances in radiation damage resistance, electrical conductivity, hydrogen storage and especially thermo electricity where even world records in both p- and n-type semiconductors were broken. This review provides a summary of some of these recent developments. Special emphasis is placed on the use of SPD processing in achieving increased thermo electricity, an improved hydrogen storage capability, materials for use in biomedical applications, and the fabrication of high-strength metal-matrix nanocomposites.

Biography

Daria Setman has completed her PhD in Physics in 2010 at the University of Vienna, Austria. After finishing her own FWF (Austrian Science Fund), prestigious Hertha-Firnberg project, she became a Senior Lecturer at the Faculty of Physics at the University of Vienna. Her main expertise is deformation of materials with high pressure torsion and analysis by differential scanning calorimetry.

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E Lesniewska et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

TOMOGRAPHIC AND CHEMICAL ANALYSIS OF THE LIPID VESICLES INSIDE BACTERIA FOR BIOFUEL PRODUCTION BY A NEW MULTI-FREQUENCY UA-AFM-IR PLATFORM

E Lesniewska[1], M J Virolle[2], E Aybeke[3], A Deniset-Besseau[3], N Pocholle[1], E Bourillot[1] and A Dazzi[3]
[1]ICB UMR CNRS 6303, University of Bourgogne, France
[2]I2BC UMR 9198, Universite Paris-Sud, France
[3]Universite Paris-Sud, France

We have developed a new AFM-based platform combining IR spectroscopy and acoustic and/or microwave 3D tomography to detect and characterize lipidic vesicles present in the cytoplasm of various micro-organisms. We started with the bacteria *Streptomyces* that is able to store excess of carbon as triacylglycerols (TAGs) in lipid vesicles. TAG are a ready-to-use source of bio-diesel, chemically and structurally identical to those found in commercial fuels. To illustrate the potential of these techniques, we will present the detection and size distribution (accuracy under 10 nm) of triglycerides vesicles in *Streptomyces* using high-resolution infrared microscopy AFM-IR as well as acoustic wave in ultrasound mode UA-AFM. We extended the excitation range to microwave (range up to 16 GHz) and achieved a comparative study of AFM-IR, acoustic and microwave scanning analysis. Our results indicate that the coupling of these techniques constitutes a great advantage to fully characterize chemical, topographical and volumetric parameters of a biological sample. We will present a 3D reconstruction of bacteria or yeast cells, showing the in-depth vesicles distribution. Similar analysis will be carried out with oleaginous (*Yarrovia lipolytica*) and non-oleaginous yeasts (*Saccharomyces cerevisiae* yeasts) as well as with Listeria in order to demonstrate the great potential of acoustic and microwave microscopy.

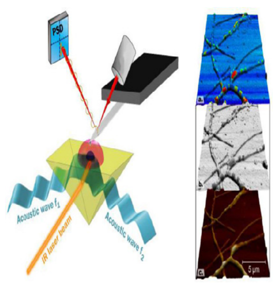

Fig 1: MS-AFM-IR platform
Fig 2: – From top to bottom: AFM-IR at 1740 cm- 1, UA-AFM at 640 kHz and AFM image (Range 10 µm)

Angelica Chiodoni et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

NANOSTRUCTURED CATALYSTS FOR CO_2 REDUCTION

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The global issues caused by the increasing CO_2 concentration in the atmosphere and the need to exploit alternative energy sources, have pushed the research towards the optimization of nanostructured materials with tailored physical, chemical or chemical/physical properties. In particular, photo-electro catalysts have been proposed to exploit the CO_2 as raw material to obtain added-value products. In this framework, an overview of the most promising materials presented in literature for the CO_2 reduction are given, together with an overview of 2D and 3D catalysts prepared within the Center for Sustainable Future Technology of the Italian Institute of Technology. In particular, Sn and Cu oxides-based electrocatalysts are proposed, together with other transition metal oxide-based catalysts. The results regarding the use of dendrimers solutions as electrolytes containing CO_2, as well as *ab-initio* simulation activity for the understanding of the active catalytic sites in 2D electrocatalysts, are also presented.

Biography

Angelica Chiodoni has completed her MSc in Material Science from Università degli studi di Torino in 2001 and PhD in Physics in 2005 from Politecnico di Torino. - Currently, she is serving as the Coordinator of the electron microscopy facilities and laboratories of Centre for Sustainable Future Technologies-Istituto Italiano di Tecnologia. She also Coordinates a scientific activity addressed to photo-electro heterogeneous catalysis of CO_2 reduction into valuable fuels and chemicals.

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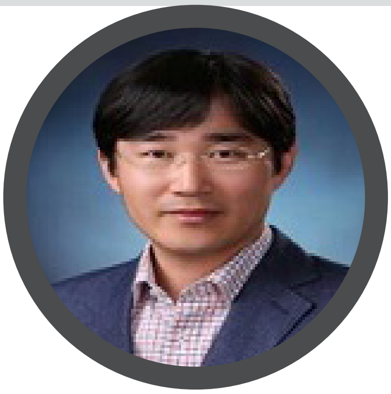
Seung Hwan Ko, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

SELECTIVE LASER PROCESSING OF METAL NANOMATERIALS FOR FLEXIBLE AND STRETCHABLE ELECTRONICS APPLICATIONS

Seung Hwan Ko
Seoul National University, Republic of Korea



It is well expected that the future electronics will be in the form of wearable electronics. Google's Smart Glass and Apple's iWatch are the first generations of wearable electronics. However, they are still mainly composed of rigid electronics, even though human body is soft and elastic. To realize more meaningful and practical wearable electronics, electronic components should be stretchable or at least flexible. We developed various laser based selective process of metal nanomaterials for flexible and stretchable electronics fabrication. The proposed technology has the following features. Nanomaterials have unique thermal properties such as size dependent melting temperature drop. This will allow novel metal deposition method development on plastic substrate without thermal damage to the substrate. Nanomaterials have unique optical properties such as strong surface plasmon absorption peak. Due to this characteristic, if the wavelength is tuned properly, very efficient and strong laser absorption is possible. Laser can be used as a local heat source to selectively induce the melting of nanomaterials with the minimum or no thermal damage to the substrate. Nanomaterials have enhanced mechanical properties. This will allow the development of the very reliable flexible and stretchable electronics. As a feasibility test of nanomaterial based on flexible and stretchable electronics research, we demonstrated a highly stretchable conductor, highly transparent touch panels, stretchable heaters, flexible fuel cells, flexible solar cells, stretchable nanogenerator etc. This is just a very tiny fraction of application area of our works. We expect our approach can be applied to huge range of wearable electronics elements in flexible and stretchable forms and ultimately to all future electronics. Therefore, this research results have a great ripple effect on various future electronics development and will be sustainably studied. Considering the huge impact, originality and advantages of our research results, this paper will provide basic research results and becomes a classical reference for future wearable electronics field.

Biography

Seung Hwan Ko is a Professor in Applied Nano and Thermal Science Lab, Mechanical Engineering Department Seoul National University, Korea. Before joining Seoul National University, he was a Faculty at KAIST, Korea. He received his PhD degree in Mechanical Engineering from UC Berkeley in 2006. He worked as a Researcher at Lawrence Berkeley National Lab until 2009. His research interest is Laser Assisted Nano/Micro Fabrication process development, laser-nanomaterial interaction, low temperature process development for flexible, stretchable and wearable electronics, and crack assisted nanomanufacturing.

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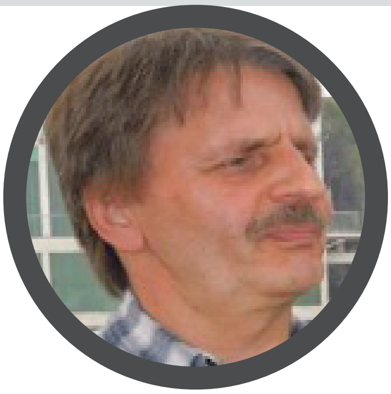
Vaino Sammelselg, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

THIN AND ULTRATHIN PROTECTIVE COATINGS: MULTIFUNCTIONAL AND INDUSTRIAL

Vaino Sammelselg
University of Tartu, Estonia



Corrosion costs are still huge, reaching up to 1% from gross national product of many industrial countries. From other side, society cannot develop further without considerable saving in energy and materials, and better protecting our environment. Transferring these demands into the coatings world means that the coatings must be as thin as possible and produced by energy and environment saving technologies. Thin and ultrathin coatings have several naturally positive properties as compared with the traditional, thick protective coatings: better elasticity and optical transparency, smaller residual stresses, etc. But thin coatings must be still well protective, wear resistive, and if needed, paintable and/or biocompatible. For development of thin protective coatings, several techniques were used, e.g. atomic layer deposition, ALD, for preparing nanolaminates of metal oxides and electrophoresis for nanographene ultrathin films, and anodizing plus ALD for new thin protective coating applicable for anodizable alloys; the latter technology is widely patented. In the presentation, results of laboratory studies, tests will be presented, first introductions of the methods into industry will be reviewed, and perspectives of further developments will be discussed.

Biography

Väino Sammelselg has completed his PhD in 1989 from Institute of Physics of Estonian Academy of Sciences and in the following years, he was Visiting Researcher in several universities of Finland and Sweden. In 2003, he was elected Inorganic Chemistry Professor in the Institute of Chemistry of University of Tartu and is serving till today; also he is Head of Materials Science Department in the Institute of Physics. His main scientific interests are thin film and coating technology and characterization, corrosion protection and nanotechnology applications. He has published more than 140 papers referred in WOS database, and has h-index 32.

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EuroSciCon

EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

A Ivankovic et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

TAILORING THE PROPERTIES OF STRUCTURAL ADHESIVES AND FIBRE REINFORCED PLASTICS USING NANOADDITIVES

A Ivankovic[1], N Murphy[1], D Quan[1], D Carolan[2], C Rounge[1] and J Labarga Urdaniz[3]

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This work examines the effects of nano-additives, including core-shell rubber (CSR) nanoparticles, silica nanoparticles, multi-walled carbon nanotubes (MWCNTs), graphene nanoplatelets and their hybrid combinations on the mechanical properties, electrical conductivity and fracture toughness of epoxy based structural adhesives and carbon reinforced plastics (CFRPs). The addition of CSR nanoparticles significantly increased the fracture toughness of epoxies with the main toughening mechanisms being rubber cavitation followed by plastic void growth and shear band yielding. For example, the addition of 30 vol% CSR nanoparticles increased the fracture energy of a structural adhesive joint by over ten fold. However, the addition of CSR nanoparticles reduced the mechanical properties, i.e. stiffness of the modified resin. Hybrid nano-composites where silica/CSR nanoparticles were mixed into the resin at appropriate ratios eliminated this problem and a good balance between the toughness and mechanical properties is achieved i.e. nano-composites with a fracture energy five times that of the unmodified epoxy were obtained with no discernible drop in mechanical properties. The addition of a small amount of MWCNTs/graphene yielded reasonable increase in the fracture energy of epoxy. However, the agglomeration of MWCNTs/graphene at a higher concentration resulted in decrease in the mechanical properties and fracture toughness. Excellent electric conductivity was obtained for adding only a small amount of MWCTNs/graphene (<0.5%) in the epoxies. The incorporation of MWCNTs to bulk epoxy and CFRPs moderately increased the mode-I fracture energy, and significantly increased the mode-II fracture energy, i.e. the average mode-II fracture energy of CFRPs increased from 2026 J/m2 to 5491 J/m2 due to the addition of 1 wt% MWCNTs. The superior toughening performance of MWCNTs in mode-II fracture is attributed to two reasons: 1) increased MWCNT breaking and crack deflection mechanisms under shear load, and 2) large fracture process zone accompanied with extensive hackle markings and micro-cracks ahead of the mode-II crack tip of CFRPs, which resulted in significant number of MWCNTs contributing to toughening mechanisms.

Biography

A Ivankovic is a Professor of Mechanics of Materials (since 2004) and Head of Mechanical Engineering Programs (since 2012), (Head of Mechanical Engineering Discipline 2006-2011). He is a Founding Director of UCD Centre of Adhesion and Adhesives established in 2010, and UCD-Bekaert University Technology Centre (UTC) established in 2015. He is also a Visiting Professor at Imperial College London, ex Head of Structural Adhesives Division of Adhesion Society (2014-2016), Irish Elected Member for International Fracture Society (2017-), an External Examiner of ME Mechanical program at Trinity College Dublin (2016-). Currently, he leads the research group of 5 MSc, 7 PhD students and 4 PostDoc researchers. The main research focus of the group is the process-structure-property relationship towards materials by design, which involves multiscale characterisation and modelling of thermo-mechanical, damage and fracture behaviour and nanomodification and tailor design of polymers, composites, adhesives and super hard materials. Recently, the group's research also focuses on additive manufacturing. The group has access to excellent processing, thermo mechanical testing, video, microscopy, analytical and high performance computing facilities. His track record includes: i) 340 publications (105 journal, 5 book chapters, 230 conference), ii) 25 graduated PhDs (4 of which are Full Professors), 25 MSc students, 15 past Postdocs and 1 Marie Curie Research Fellow, iii) 1 patent, iv) 1 licence, v) Strong links and collaboration with industry and academia both nationally and internationally, vi) Memberships of a number of scientific committees, Editorial Boards, Review Panels, coordination of an international ESIS Mixed Mode Round Robin. His area of expertise includes fracture, modelling, polymers, composites, adhesives.

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Qi Li, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

NANODIELECTRICS FOR HIGH-TEMPERATURE FILM CAPACITORS

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Polymeric dielectric materials enable film capacitor technology that is critical in high-power energy storage and pulsed power systems, hybrid electric vehicles, aerospace power conditioning and advanced electromagnetic weapons. Conventional high-temperature polymeric dielectric materials dissipate a large amount of heat as they are involved in continuous operations under high temperature and strong electric field conditions, which, unfortunately, leads to thermal runaway and failure of film capacitors. We propose to tackle the key issues associated with thermal runaway in plastic film capacitors by focusing on the suppression of charge injection from electrodes and thermally activated migration of charge carriers, rather than following the traditional design of high-temperature polymer dielectrics that only concerns the thermal stability of materials. Advanced composite approaches, thin-film deposition technologies, comprehensive characterizations of dielectric and capacitive energy storage properties as well as computational simulations are utilized to cover from structure control to material preparation, to performance assessment and to device modelling. The ultimate goal of this study is to develop novel high-temperature polymer dielectrics that can maintain dielectric stability and energy storage properties under high electric field and high temperature, and effectively suppress the thermal runaway of plastic film capacitors.

Biography

Qi Li is currently an Associated Professor of Electrical Engineering at Tsinghua University, China. He received his PhD degree in Materials Science at Wuhan University of Technology, China in 2013. From 2013 to 2016, he was a Postdoctoral fellow at the Department of Materials Science and Engineering of the Pennsylvania State University. He started his appointment at the Department of Electrical Engineering of Tsinghua University in December 2016. His research interest has been focused on polymer-based nanocomposite materials with unique dielectric properties for electrical energy storage and conversion. He has published over 50 SCI-indexed papers in *Nature, PNAS and Nature Communications*, etc. He was awarded the MRS Postdoctoral Award in 2016 because of his scientific achievement in polymer nanocomposites for energy storage and conversion. He is an Editorial Board Member of *IET Nanodielectrics*, and is the Guest Editor of Special Issue Polymers for Film Capacitors published by Materials.

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EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

Poonam Agarwal, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

GLUCOSE SENSOR USING MICROWAVE SENSING TECHNIQUE

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Jawaharlal Nehru University, India

The conventional glucose measuring electrode based techniques are highly time consuming, need skilled people, proper laboratory set-up for testing. Seeing the cruciality of the glucose testing, there is need to explore real-time techniques. The main aim of this paper is to demonstrate a real-time label-free glucose sensor using microwave sensing technique. Currently, we are working on various designs on coplanar waveguide transmission line to demonstrate microwave biosensor. The microwave biosensor is fabricated using microwave laminate board and polymer technology. In this, we proposed biosensor fabricated in-house making use of unconventional fabrication process without the need of cleanroom and costly equipments unlike most of the reported microwave sensors fabricated using conventional MEMS micromachining process. Secondly, the labeled sensing techniques may have an inaccuracy which can be overcome using label-free technique which may be highly useful for biomedical applications.

Biography

Poonam Agarwal has received her PhD from Indian Institute of Science Bangalore, India in 2011. She worked as Postdoctoral Researcher at Nanyang Technological University, Singapore from 2012-2013. She is serving as an Assistant Professor at School of Computer and Systems Sciences, Jawaharlal Nehru University New Delhi, India since 2013. She has received DST INSPIRE Faculty Award by Department of Science and Technology, Government of India, through which fellowship and research grant is provided. Her research interest is focussed on exploring unconventional low cost micromachining techniques to implement mesoscale devices for applications such as energy harvesting device, microwave biosensor etc.

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D Dixon et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

MIXED MONOLAYER AND PEG LINKER FUNCTIONALISED GOLD NANOPARTICLES

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[2]Queen's University Belfast, UK

In order to create a clinically useful nanoparticle based treatment, it is necessary to functionalise the surface of the nanoparticles. Poly ethylene glycol (PEG) is often added to stop aggregation in-vivo and to prolong the circulation time by inhibiting any undesired immune responses. Other groups such as antibodies can be added to target nanoparticles to tumours, while peptides can be used to enhance cell uptake and induce endosomal escape. Finally therapeutic payloads such as drugs can also be attached to the nanoparticle surface. In the case of gold nanoparticles (AuNPs), thiol chemistry is frequently used to tether the various groups to the surface and two different attachment arrangements are possible. Firstly, all the groups can be attached directly to the AuNP surface creating a mixed monolayer arrangement or the biologically active groups can be attached via a linker unit such as PEG. In this case, one end of the PEG is attached to the AuNP surface with the biologically active group reacted with the free end. This linker arrangement has the potential benefits of permitting higher loading levels, and should allow for improved biological availability, as the biologically active groups are freely available on the outside of the functionalised nanoparticles. We report that the attaching H5WYG, an internalisation and endosomal escape peptide to ~15nm AuNPs via a PEG linker rather than using a mixed monolayer arrangement results in greater levels of cell uptake and enhanced radiosensitisation behaviour. We also report on the influence of pH on the attachment of peptides to AuNPs using thiol chemistry, investigate the low term stability of functionalised AuNPs, and highlight some of our published animal data on the radiosensitisation potential of peptide modified AuNPs.

Biography

D Dixon has received his PhD in Polymer Science from Queen's University Belfast in 2000 and is currently, serving as a Senior Lecturer in Nanotechnology, at Ulster University in Northern Ireland. His work is focused on functionalised gold nanoparticles for applications in cancer treatment. He has published around 50 papers.

EuroSciCon

October 04-06, 2018
Amsterdam, Netherlands

EuroSciCon Conference on
Nanotechnology & Smart Materials

Ankit Agarwal, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

DEEP LEARNING MODEL FOR MEMS

Ankit Agarwal
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Since a decade, deep learning (DL) has been exploited in various fields such as healthcare, automobile, electronics, weather prediction, telecom and many more. DL has the ability to learn the dependence between two sets of data and to generalize on unseen data, whereas major characteristic of DL is to discover intricate structure in large datasets. It has huge potential to be used in materials process and micro-electro-mechanical systems (MEMS). MEMS devices' experimental and commercial simulator results may not be matching due to unavoidable environmental conditions while experimenting, difference in design and fabricated device, etc. DL model is made using MEMS devices experimental study which may give accurate predictive result compared to simulators. These analytical models prepared using DL may be more accurate, fast and cost effective solution as compared to commercial available MEMS softwares.

Biography

Ankit Agarwal has completed his B Tech from BIET, Jhansi, India and M Tech from IIT, Delhi. He worked as Research Assistant at Trinity College Dublin, Dublin City, Ireland. Currently, he is working as a Senior Data Scientist in Mobileum. His interests are to explore machine learning and deep learning for experimental applications. He has already demonstrated deep learning for telecom and computer vision. He is highly motivated to apply deep learning for MEMS systems.

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EuroSciCon

DAY 3

Keynote Forum

EuroSciCon Conference on

Nanotechnology & Smart Materials

October 04-06, 2018 Amsterdam, Netherlands

Koji Fujita et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-023

WIND TUNNEL TEST OF DIELECTRIC ELASTOMER ACTUATOR FOR MARS AIRPLANE

Koji Fujita[1], Mikio Waki[2], Mitsuru Uejima[3], Makoto Takeshita[3] and Seiki Chiba[4]
[1]Institute of Fluid Science-Tohoku University, Japan
[2]Asset-Wits Inc, Japan
[3]Zeon Corporation, Japan
[4]Chiba Institute of Science, Japan

Dielectric elastomer (DE) is a relatively new transducer technology uses rubberlike polymers (elastomers) as actuator materials. The basic element of DE is a very simple structure comprised of a thin elastomer sandwiched by soft electrodes. When a voltage difference is applied between the electrodes, they are attracted to each other by coulomb forces leading to a thickness wise contraction and plane wise expansion of the elastomer. At the material level, DE actuator has fast speed of response, with a high strain rate, high pressure and power density of 1 W/g. Recently, airplanes are paid attention as a new platform for Mars exploration. The Mars airplane must be lightweight to fly using aerodynamic forces in the rarefied Martian atmosphere. Therefore light-weight and high-power actuators are required for the Mars airplane. The advantages of the DE actuators are beneficial for the Mars airplane. The DE actuators have a possibility to be used as actuators for control surfaces (i.e. ailerons, rudder, and elevator) and a propeller of the Mars airplane. This research reports a result of a wind tunnel test of a control surface actuation using DE actuator to investigate a feasibility of the DE actuators for the Mars airplane. A chord length of the wing is 160 mm, including the control surface of 55 mm. A Ø80 mm, diaphragm-shaped DE of 0.1 g is used. Bias voltages are from 3.2 to 3.7 kV. Angles of attack are from -10° to 10°. Flow velocities are 0, 10, and 15 m/s. Deflection angles of the control surface are measured. The result shows that the control surface is sufficiently actuated by DE actuator under various flow conditions

Biography

Koji Fujita has received his BSc degree in Aerospace Engineering from Tohoku University in 2010 and pursued PhD at Tohoku University under the supervision of Professor Hiroki Nagai. His research focussed on an airplane for Mars exploration. His thesis work involves the conceptual design of the Mars airplane and aerial deployment technique. He continued this research at Japan Aerospace Exploration Agency as a Research Fellowship for Young Scientists of Japan Society, for the Promotion of Science. Now, he is serving as an Assistant Professor at the Institute of Fluid Science at Tohoku University. He started a joint research with Co-Authors to utilize dielectric elastomer actuators for his airplane for Mars exploration.

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Mohsen Adeli et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-023

SOFT TWO DIMENSIONAL NANOMATERIALS AT BIOINTERFACES

Mohsen Adeli[1, 2] and Rainer Haag[1]
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[2]Lorestan University, Iran

Rapid development in two-dimensional nanomaterials and their biomedical applications have raised fundamental questions about their biointeractions. However, any control over these interactions and practical application of the 2D devices relay on understanding their mode of action. Due to their high polydispersity and undefined structures, the mechanism of their biointeractions is a controversial topic. For a comprehensive study of these interactions and to obtain reproducible results at nanobiointerfaces, the structure of these nanomaterials and in particular their exposure should be defined. Recently, we have developed a method for a controlled functionalization of different two-dimensional nanomaterials by which we have synthesized different smart systems with well-defined functionalities, dimensions, and isoelectric points (pI). We found that cellular uptake pathways, pathogen interactions and intracellular localization of these 2D nanomaterials strongly depended on their surface charge and functionality. By manipulating these factors, we were able to tune the interactions between such nanomaterials and biosystems

Biography

Mohsen Adeli has started his independent academic carrier at Lorestan University in 2005, where he was active as an Assistant Professor in the field of Functional Carbon Nanomaterials including Carbon Nanotubes and Dendritic Polymers. He was promoted to the rank of Full Professor in Chemistry in 2013. He was invited to the Institute of Chemistry and Biochemistry at Freie Universität Berlin, Germany, as a Guest Professor within the collaborative research center (SFB) 765, in 2014. His research focuses on the Synthesis and Characterization of Functional Hybrid Nanomaterials.

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EuroSciCon

DAY 3

Plenary Sessions

EuroSciCon Conference on

Nanotechnology & Smart Materials

October 04-06, 2018 Amsterdam, Netherlands

DAY 3

October 06, 2018

Sessions

Smart Structures | Smart Materials in Industrial Application | Nanotech for Energy and Environment | Nanoscience and Technology | Materials Science and Engineering Physics | Advanced Nanomaterials | Nano Medicine | Ceramics and Composite Materials | Graphene and 2D Materials

Session Chair
Thomas Schimmel
Karlsruhe Institute of Technology, Germany

Session Co-Chair
Daria Setman
University of Vienna, Austria

Session Introduction

Title: **The Salvinia Effect: Perspectives for Drag Reduction and Antifouling Using a Permanent Layer of Air Under Water**
Thomas Schimmel, Karlsruhe Institute of Technology, Germany

Title: **Assessment of representative material properties of ceramic materials through inverse analysis**
Vladimir Buljak, University of Belgrade, Serbia

Title: **A concept of double layer capacitance motivated by nanotechnology**
Jingyuan Chen, University of Fukui, Japan

Title: **Widefield confocal microscope for surface wave k-vector measurement**
Suejit Pechprasarn, Rangsit University, Thailand

Title: **A magnetic SERS probe fabrication & in cell**
Huanhuan Feng, Harbin Institute of Technology, China

Title: **Tumor Vascular Embolization Therapy Triggered via BBR Nanoparticle Aggregation**
Tingting Zheng, Peking University, China

Title: **The Effect of Magnetic Resonance Imaging (MRI) on Some Properties of Acrylic Resin Denture Base Materials**
Ahmed I. AL-Khyet, Mosul University, Iraq

Title: **Structural Health Monitoring Based on Wave Propagation Pattern in Space Frame Structures**
Ahmed Elbelbisi, Zagazig University, Egypt

Title: **Structural Health Monitoring Based on Wave Propagation Pattern in Space Frame Structures**
Mohammad Tahay Abadi, Aerospace Research Institute, Iran

Title: **Green synthesis of iron oxide nanorods from deciduous Omani mango tree leaves for heavy oil viscosity treatment**
Majid Al-Ruqeishi, Sultan Qaboos University, Oman

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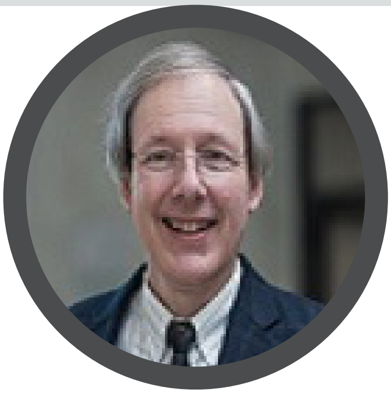
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

Thomas Schimmel, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

THE SALVINIA EFFECT: PERSPECTIVES FOR DRAG REDUCTION AND ANTIFOULING USING A PERMANENT LAYER OF AIR UNDER WATER



Thomas Schimmel
Karlsruhe Institute of Technology (KIT), Germany

Three key problems which ships are facing, are related to the fact that the ship hull is in contact with water: drag, the largest part of the fuel consumption of ships is due to the friction with the surrounding water; corrosion, a phenomenon which is also largely related to the fact that the ship is in direct contact with the surrounding sea water with its high content of salt; fouling, the growth of sea organisms would not happen if the ship would be surrounded by air instead of water. Latest developments in the area of bionic surfaces show that avoiding the direct contact between a ship and the surrounding water appears feasible and opens intriguing perspectives for practical applications. The floating water fern *Salvinia molesta* demonstrates how permanent layers of air can be kept under water for weeks. Within a joint research project of the Universities of Bonn, Karlsruhe and Rostock, a thorough understanding of this recently discovered Salvinia effect was achieved. This leads to the development of a novel type of artificial surfaces which are based on their topographic structure and chemical functionality, keeping a permanent layer of air under water. Meanwhile, such artificial surfaces are capable of keeping an air layer under water for even much longer times than the Salvinia plant itself, the prerequisite for the applications mentioned above using artificial, specially designed surfaces which remain dry although being kept under water. The design and fabrication of such artificial surfaces and their properties including drag reduction will be discussed. The talk will give an overview of latest developments based on this biomimetic approach and shows perspectives for future applications ranging from drag reduction to future bionic antifouling ship coatings

Biography

Prof. Dr. Thomas Schimmel holds a doctorate in physics from the University of Bayreuth. So far he had professorships at universities in Munich and Linz. Since 1996 he teaches at the Institute of Applied Physics of Karlsruhe University, Karlsruhe Institute of Technology (KIT), and participates in numerous research projects. He is the initiator and spokesman of the research network "Functional Nanostructures" in Baden-WÃ¼rttemberg. Professor Schimmel is head of the working group for nanostructuring and scanning probe technology.

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EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
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Vladimir Buljak, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

ASSESSMENT OF REPRESENTATIVE MATERIAL PROPERTIES OF CERAMIC MATERIALS THROUGH INVERSE ANALYSIS

Vladimir Buljak
University of Belgrade, Serbia

Ceramic materials often involve complex constitutive models apt to describe material mechanical behaviour required for accurate numerical simulations. These models can use either micro-mechanical approaches to address crystalline scale or phenomenological approaches by studying the response of representative volume of material. When proper model is selected, the accuracy of simulations rests on quantification of parameters (i.e. material properties) entering into governing equations. The assessment of these properties is done on the basis of experiments. For complex models governed by large number of parameters, such calibration is rather challenging. If the selected experiment be too simple, the parameter quantification results in fitting the response of single experiment, not in the assessment or material representative properties. Systematic way of resolving this difficulty is through the application of inverse analysis, centered on the minimization of discrepancy function designed to quantify the difference between measured quantities and their computed counter parts. Designed discrepancy function thus depends on elevated number of sought parameters, so the inverse problem is typically ill-posed requiring the application of various regularization techniques, with measured quantities carefully selected to ascertain good sensitivity to the parameters. Within this lecture, some methodological novelties related to the above outlined problem will be presented with reference to two engineering problems. The first one concerns the calibration of phenomenological models used to simulate ceramic powder compaction. It will be shown that through inverse analysis identification of parameters can be performed using only data collected from compaction test. The second problem concerns thermally induced micro-cracking observed in porous ceramics employed for diesel particulate filters. A micro mechanical model is developed and numerically implemented to simulate crack initiation and healing, typically observed within these materials when subjected to thermal cycling. By incorporating the developed model with inverse analysis inter-granular fracture toughness of considered ceramic material can be assessed

Biography

Vladimir Buljak has completed his PhD in 2009 from Politecnico di Milano. Upon completion of his PhD, he spent additional two years as Postdoc within the same institution up to 2011. After that, he moved to the University of Belgrade, Mechanical Engineering Faculty, as an Assistant Professor at the Department of Strength of materials from 2016. He became an Associate Professor at the same institution. He is Professor In Charge as Visiting Professor for the course Theory of plasticity at Politecnico di Milano since 2015. He was Visiting Scientist at University of Trento in 2014 and German Federal institute for materials research and testing - BAM at Berlin in 2016. He was Scientist In Charge for University of Belgrade for European FP7-INT project CERMAT2, dealing with advanced ceramic materials. He has published one book and more than 20 papers in reputed journals.

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Jingyuan Chen, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

A CONCEPT OF DOUBLE LAYER CAPACITANCE MOTIVATED BY NANOTECHNOLOGY

Jingyuan Chen[1] and Koichi Jeremiah Aoki[2]
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[2]Electrochemistry Museum, Takagichuoh 3-1304, Fukui, 910-0806, Japan

Determination of heterogeneous rate constants of redox reactions or charge transfer resistances always involves ambiguities due to participation in double layer (DL) capacitances and solution resistances. The rate constants determined by the steady-state voltammograms at ultra-microelectrodes are inconsistent with time-dependent voltammograms, implying participation of the DL impedance. We examine controlling variables of DLs by paying attention to frequency-dependence of the capacitance on the basis of definition of the current and the capacitance. The capacitance is obeyed by the power law of the frequency. It is controlled by orientation of limited amount of solvent dipoles, independent of salts. Redox species, of which dipoles are oriented oppositely to the solvent dipoles, decrease the DL capacitance and make the value negative at high concentration of the specie. The decrease in the capacitance increases the real impedance, as predicted from the phase angle, yielding a extra resistance. This may be a ghost charge transfer resistance. However, there are a number of actually well-defined charge transfer resistances, which are observed as transferring rates through films on electrodes. This logic will be explained step-by-step by tracing the six sections: difference in heterogeneous rate constants by steady-state and fast voltammetry; frequency-dependent double layer impedance; variables of determining DL impedance; origin of the frequency dependence; DL impedance complicated by diffusion-controlled current of redox reactions; redox reaction of unanticipatedly adsorbed redox species

Biography

Jingyuan Chen has completed her PhD from University of Fukui, supervised by Prof Koichi Aoki. Then she worked as a Senior Researcher at MAEDAKOSEN Company Limited; as a Full-Time Lecturer at Faculty of Science in Kanazawa University; as a Visiting Scholar at Henry White's laboratory in University of Utah. In 2001, she moved to University of Fukui and worked as an Associate Professor and was appointed as a Full Professor at Department of Applied Physics in 2017. She has set the life aiming to solving fundamental subjects of basic electrochemistry and defined the work focus into physics of interfacial phenomena. During her career, over the past 17 years, she has supervised more than 30 PhD students. She has published more than 90 papers in reputed journals.

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Suejit Pechprasarn, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

WIDEFIELD CONFOCAL MICROSCOPE FOR SURFACE WAVE K-VECTOR MEASUREMENT

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Optical surface waves are guided light on surface of optical structures. There are several optical structures that support optical surface waves, such as nanostructures, gratings, optical waveguides and metamaterials. Optical surface waves have proven themselves very promising candidates for several applications including biosensing, optical computing and optical circuitry. The characteristics of surface wave can be characterised by the wave vector (k-vector) of the surface wave. In this talk, we will discuss how a modified confocal microscope integrated with a phase spatial light modulator allows us to measure both the real part and the imaginary part (attenuation coefficient) of the surface wave k-vector. Surface plasmon resonance (SPR) excited on a uniform gold surface through Kretschmann configuration is employed as an example in this talk. Note that the system is not limited to the SPR. It is also applicable to other types of optical surface waves. We have demonstrated in our recent publication that the modified confocal not only provides the k-vector measurement both real and imaginary, it also allows us to separate different loss mechanisms in SPR. One limitation of the system was the single point detection. Here, we will discuss the current stage of our development in widefield confocal surface plasmon microscope, which allows us to measure multiple points simultaneously. This has been achieved by integrating another amplitude spatial light modulator in the image plane of the objective lens allowing the image plane to be sequentially coded and post-processed to recover the confocal image.

Biography

Suejit Pechprasarn has received his B Engg degree in Electronic and Computer Engineering (1st class Honour) from the University of Nottingham in the UK and Electrical Engineering degree from Thammasat University in Thailand in 2007. He then commenced his Doctorate degree study at the Institute of Biophysics, Imaging and Optical Science (IBIOS), the University of Nottingham in the UK and received his PhD in 2012. He was appointed as a Postdoctoral Research Fellow at the Institute for two years before joining the Hong Kong Polytechnic University in Hong Kong SAR in 2014 as a Research Fellow until the present. Since Dec' 2014, he has also been working as an Invited Guest Lecturer and Associate Dean for Research, Innovation and Foreign Affairs at Rangsit University, Thailand. He has recently been appointed as Assistant Professor at Shenzhen University in China.

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EuroSciCon

DAY 3

Scientific Tracks & Abstracts

EuroSciCon Conference on

Nanotechnology & Smart Materials

October 04-06, 2018 Amsterdam, Netherlands

Huanhuan Feng et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

A MAGNETIC SERS PROBE FABRICATION AND IN CELL

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[3]Peking University Shenzhen Hospital, China

We have fabricated a magnetic SERS probe for biomedical detection through a handy modified Stöber reaction. The silica reaction is occurred under magnetic field to align the magnetic particles and string them together to form micro rob structure. Its geographical magnetic moment offers a perfect platform for precise movement and locomotion manipulation under magnetic field. We can make it go through a micro scaled maze easily to reach targeted area via magnetic guiding and driving. Not only it could move as we designed but also it could rotate with demanding angular velocity for some very special application such as cell tissue depletion experiments. Its surface satellite doping silver is just adding SERS (Surface Enhanced Raman Spectrum) as an extra function for its biomedical detection. The detection ability is checked by crystal violet *in vitro*. The full potential of biomedical sensor in vivo will be explored in view. Its multi-functional ability makes it an outstanding candidate for further biomedical application such as micro surgery robot, biomedical sensor and of course targeted drug delivery mediation

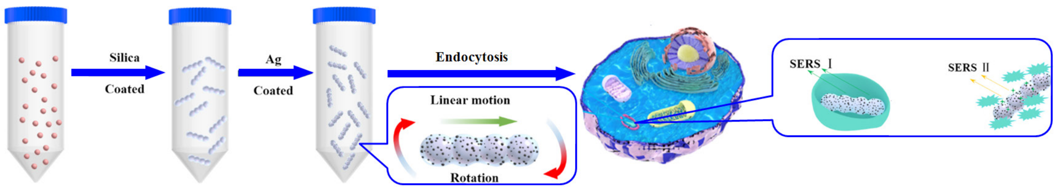

Figure 1: **Schema of SERS probe fabrication and experiments in cell**

Biography

Huanhuan Feng has completed his PhD from Wageningen University and Postdoctoral studies in Wageningen University. He is an Assistant Professor of School of Materials Science and Engineering, Harbin Institute of Technology (Shenzhen). He has published more than 20 papers in reputed journals and has been serving as an Editor of Open Chemistry, De Gruyter.

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EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

Tingting Zheng et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

TUMOR VASCULAR EMBOLIZATION THERAPY TRIGGERED VIA BBR NANOPARTICLE AGGREGATION

Tingting Zheng[1, 2], Hanqing Liu[1,2], Yawen An[3], Ziqian Zhou[1,2], Jiapu Jiao[4], Azhen Hu[1, 2], Minghua Li[1, 2], Tao Pei[2], Tao Yu[1], Huanhuan Feng[4] and Yun Chen[1, 2]
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Here we announce that berberine (BBR) nanostructure is a promising vascular embolization agent for tumour therapy. It has been reported that BBR contributes to tumour cells apoptosis by releasing reactive oxygen species (ROS) which triggers PI3K-AKT-mTOR signalling pathway. This triggering step succeeds with either focused laser beam (FLB) or focused ultrasound (FUS) under performances of photodynamic or sonodynamic therapy (PDT or SDT), respectively. Moreover, ultrasonic diagnosis shows that tumour vessels have been blocked after BBR-PDT or -SDT treatment *in vivo*. Further, we investigate what's behind and results point to self-assembly of BBR nanostructure, from nano- to micro- and macro-size. Finally, tumour vascular embolization occurs. Amphiphilic BBR chlorate tends to assemble into randomly nanostructures at room temperature in aqueous. However, spherical BBR nanostructures increase with growing temperature and BBR nanoparticles (BBRNPs) tends to monodisperse when we perform FLB or FUS. After treatment, BBRNPs start to aggregate when temperature is going down. Morphology studies from dynamic light scattering (DLS), scanning electron microscopy and optical microscopy show that BBRNPs aggregation is continuously taking place and finally ends up with macro-scale floccules. Though BBR is a commonly known photo- or sono-sensitizer for ROS-tumour therapy, it is rarely reported about what is going on after PDT or SDT therapy. Therefore, here we address BBRNPs aggregates as a promising vascular embolization which can assist PDT or SDT cancer therapy in preclinical studies

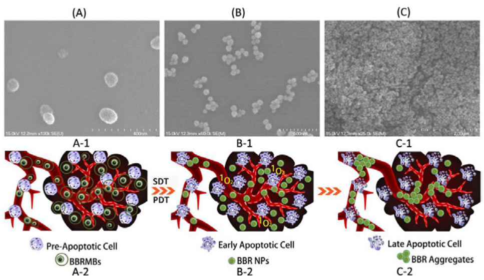

Figure 1: Progress schematic diagram of berberine nanoparticle induced tumour vascular embolization. (A) to (C) shows morphologies of berberine nanoparticles from monodispersed to oligo-aggregation and poly-aggregation. Group 1 shows BBR scanning electron microscopy images of BBR nanoparticles in different stages of self-assembly. Group 2 illustrates process of BBR nanoparticles self-assembly in tumour, following by early and late cell apoptosis. UTMD technonics

Biography

Tingting Zheng has obtained her PhD degree from Leiden University in Dec' 2014 and continued with Postdoctoral studies at Wageningen University. She is currently an Associate Professor at Peking University Shenzhen Hospital. She has published more than 25 papers in top journals and has been serving as an Editor of *Open Chemistry* since 2015.

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Ahmed I Al-Khyet, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

THE EFFECT OF MAGNETIC RESONANCE IMAGING (MRI) ON SOME PROPERTIES OF ACRYLIC RESIN DENTURE BASE MATERIALS

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Introduction: **Magnetic resonance imaging have been used nowadays as one of the accepted tool for diagnosis, estimation, and evaluation of many of human been disease; in dentistry, many of prosthodontics patients and maxillofacial-prosthesis patients may fall under the category who might be subjected to routine MRI check-up either for follow-up of certain disease or cancer patient for determination of the degree of healing or metastasis, thus, there has been growing interest in the research of the possible effect of MRI procedure on different component of dental appliances wears by those patients and one of these components is heat cured acrylic resin.**

Aims: **The aims of this study were to evaluate the effects of magnetic resonance imaging on mechanical (tensile strength, hardness), physical (color change) and chemical (FTIR, NMR) properties at different periods of time exposure.**

Material & Methods: **Total samples of (454) were prepared from acrylic based heat cured denture material, which divided into two main groups Clear, Pink, each main group was subdivide, into four groups according to exposure to MRI control; (5, 15, 30) minute each of the four sub-groups undergo different tests such as tensile strength, hardness (Rockwell) test, dimensional accuracy test, color change by spectrophotometry, surface roughness, water sorption, residual monomer release FTIR and NMR.**

Results & Conclusions: **It was concluded that exposure to MRI at different periods of time lead to altering of some physical properties at different level of significant with the exception for one to two experiments water sorption and residual monomer which showed less significant than other tests done. Also, FTIR and NMR tests demonstrated a change in vibration of bonds between two, atoms but without rotation of molecule without alter the main chemical structure of material.**

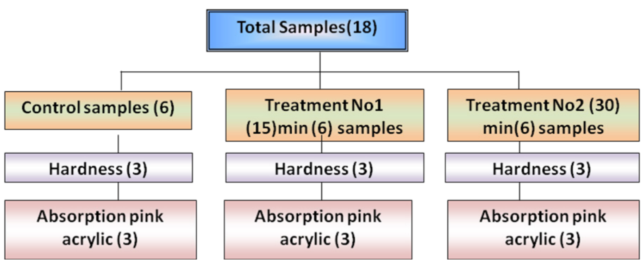

Figure 1: **Experimental design of pilot study**

Biography

Ahmed I AL-Khyet is an Assistant Lecturer in Prosthodontic Dentistry, Mosul University, Iraq. He has MSc degree in Prosthodontic Dentistry. He has published more than 8 research papers in national and international academic journals, authored 1 book. He has expertise in Oral-health and Dental field. His specific work deal with effects of (MRI) on polymers and dental products, his MSc Thesis considers the 1st one all over middle east and available on more than 10 search engines on internet.

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EuroSciCon

EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

Ahmed Elbelbisi, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

STRENGTHENING OF PRE-STRESSED STEEL-CONCRETE COMPOSITE BEAMS USING CARBON FIBER TENDONS (PARAMETRIC STUDY)

Ashraf Elshihy, Hesham Fawzy, Hilal Hassan and Ahmed Elbelbisi
Zagazig University, Egypt

Strengthening of structures using external prestressed carbon fiber reinforced polymer systems have proven to be an effective process as system strengthen the structural capacity and decrease cracks and deformability. A finite element three-dimensional model is set up to study the impact of composite beams strengthening using externally prestressed carbon fiber reinforced polymer tendons under flexural behavior studying parameters like prestress level, tendon material and tendon profile elevated from the bottom surface of steel beam flange considered under static loading. Consequences of the parametric study will give reasonable guidelines for the designers. ANSYS computer program has been used to create the non linear analysis. The accuracy of the 3D model is verified with the available experimental data. End from the finite element model and design suggestions are given

Biography

Ahmed Elbelbisi has completed his BSc from Zagazig University. He is Demonstrator at Zagazig University.

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EuroSciCon Conference on
Nanotechnology & Smart Materials

October 04-06, 2018
Amsterdam, Netherlands

Mohammad Tahaye Abadi, Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

STRUCTURAL HEALTH MONITORING BASED ON WAVE PROPAGATION PATTERN IN SPACE FRAME STRUCTURES

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An important aspect of the smart structures concept is the automated structural health monitoring in various operational environments. The present research work focuses on a technique to identify damage sources in space frame structure. The first step is performed by solely analysing the acceleration time histories recorded from the space frame structure. The procedure selects a reference signal which is close to obtained signal from the signals recorded when the structure is undamaged. Second, a prediction model is constructed from the selected reference signal in the damaged structure. Then, the residual error is defined and used to identify damages in the structure. This approach is based on the evidence that if there were damage in the structure, the estimation model previously identified using the undamaged time history would not be able to replicate the newly obtained time series measured from the damaged structure. In addition to, the increase in residual errors would be maximized at the sensors instrumented near the actual damage locations. The performance of present technique is implemented using acceleration time histories obtained from a space frame structure

Biography

Mohammad Tahaye Abadi is currently serving as an Associate Professor of Mechanical Engineering. He received his PhD from Amirkabir University of Technology (formerly called Tehran Polytechnic), Iran in 2003. His research interests include composite materials, material characterization, viscoelastic materials, shock and vibration and structural health monitoring.

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EuroSciCon Conference on
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October 04-06, 2018
Amsterdam, Netherlands

Majid S.Al-Ruqeishi et al., Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-024

GREEN SYNTHESIS OF IRON OXIDE NANORODS FROM DECIDUOUS OMANI MANGO TREE LEAVES FOR HEAVY OIL VISCOSITY TREATMENT

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Green synthesis of iron oxide nanorods were achieved by utilizing rich polyphenols in Omani mango tree leaves as a reducing agent. The obtained Iron (III) oxide nanorods (IONRs) were (15 ± 2) nm in average length and (3.0 ± 0.2) nm in average diameter. These nanorods were polycrystalline in structure with different diffraction planes indicating the presence of a specific type of IONRs which are alpha phase, hematite (α-Fe_2O_3) and gamma phase, maghemite (γ-Fe_2O_3). The relatively smaller size, distribution, and heat conversion make the obtained nanorods a good candidate for heavy crude oil cracking process. Direct microwave radiation causes a reduction in dynamic viscosity of crude oil due to the presence of dipole water molecules. The viscosity reduction rate was found to be higher when impregnated IONRs nanorods were placed within the heavy oil. The viscosity was reduced by 10% when 0.2 g of IONRs was added to 1 L of heavy oil at T = 30 °C. This reduction increased up to 38% and 49% when 0.4 and 0.6 g/L additives were added respectively at the same temperature. However, when 0.8 g of IONRs is added to the heavy oil no noticeable change in the viscosity was found, indicating the oils' additive saturation point

Biography

Majid Salim Al-Ruqeishi is a Researcher in graphene and nanomaterials fabrication field at physics department, faculty of science, Sultan Qaboos University. He holds a bachelor in science education (physics) from the Sultan Qaboos University, Sultanate of Oman, 2001 and a Master Degree in applied physics (Radiation and Plasma) from University of Malaya, Malaysia, August 2006. He acquired his PhD with full fellowship and a minimum completion period certificate in solid state physics (Nanotechnology) from the same university, August 2010. He worked as a Scientific Researcher in Science division of Oman National Commission for Education, Culture and Science, MOE, 2010-2012. Moving to sultan Qaboos University inspired him to build nanofabrication and grapheme lab with his colleagues where he supervised more than 30 final year students' projects in the field of nanomaterial synthesis and development of innovative applications in various energy fields. He published more than 25 peer reviewed journal articles, 19 as a main author. He takes keen interest in synthesizing nanomaterials and graphene by physical and chemical methods especially chemical vapor deposition technique (CVD) and to develop smart Nano-based solutions for various energy issues. Most recently, he received best researcher award in Sultan Qaboos University for the year 2015-2016, during the University day, 2ed May 2016. In addition, he was selected the best oral research presenter in the 4th international conference in nanoscience and nanotechnology, Kuala Lumpur, Malaysia, Jan 2016. Finally, he awarded a Arab-American Frontiers Fellowship by US National Academy of Sciences (NAS) to start collaborative research with graphene research group at mechanical engineering, University of Illinois at Urbana-Champaign (UIUC), Illinoi, Jan 2017.

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