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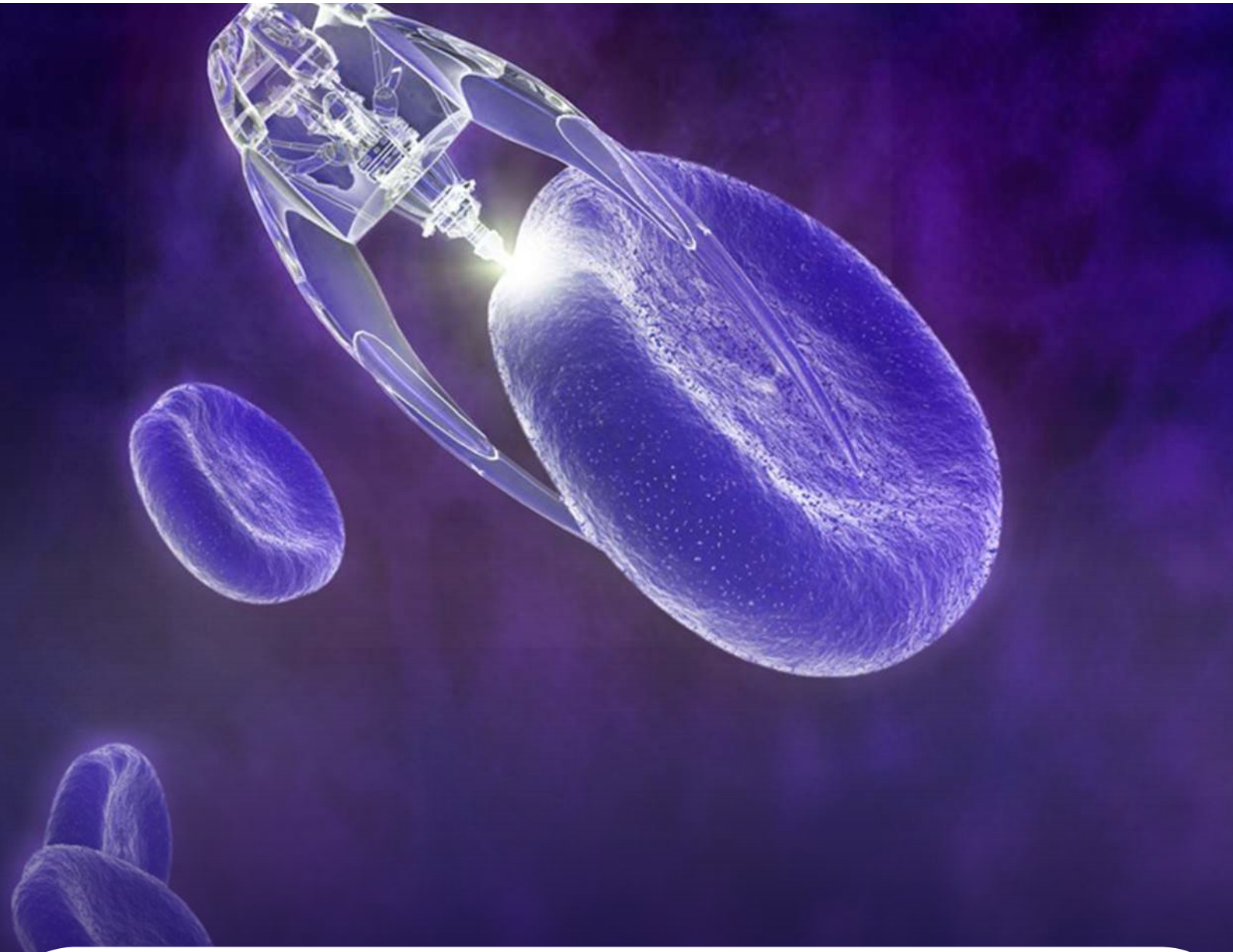
Exploring & Connecting Science

Proceedings of

2nd Global Summit and Expo on

Nanotechnology and Material Science

August 27-28, 2018 | Rome, Italy



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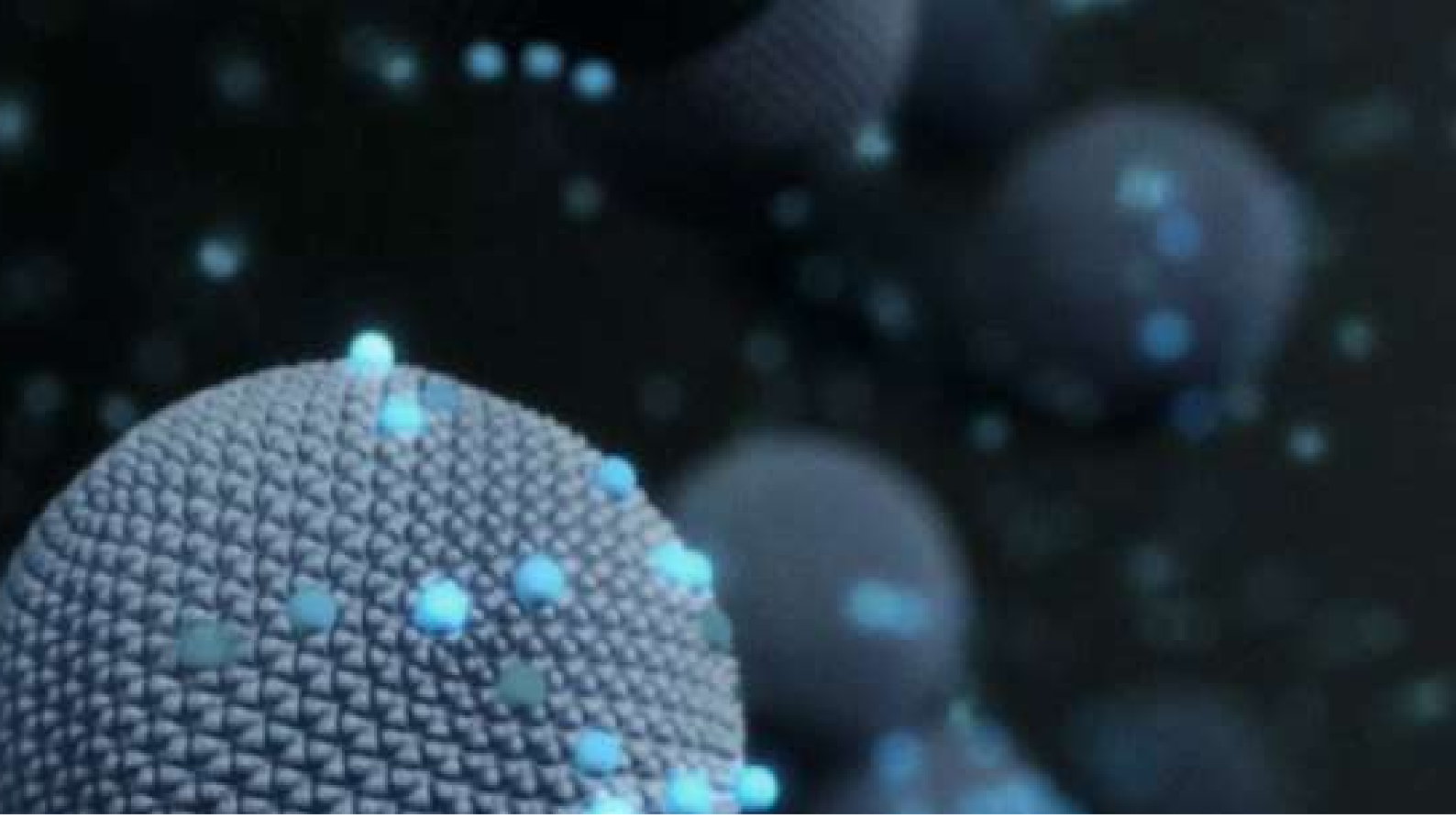

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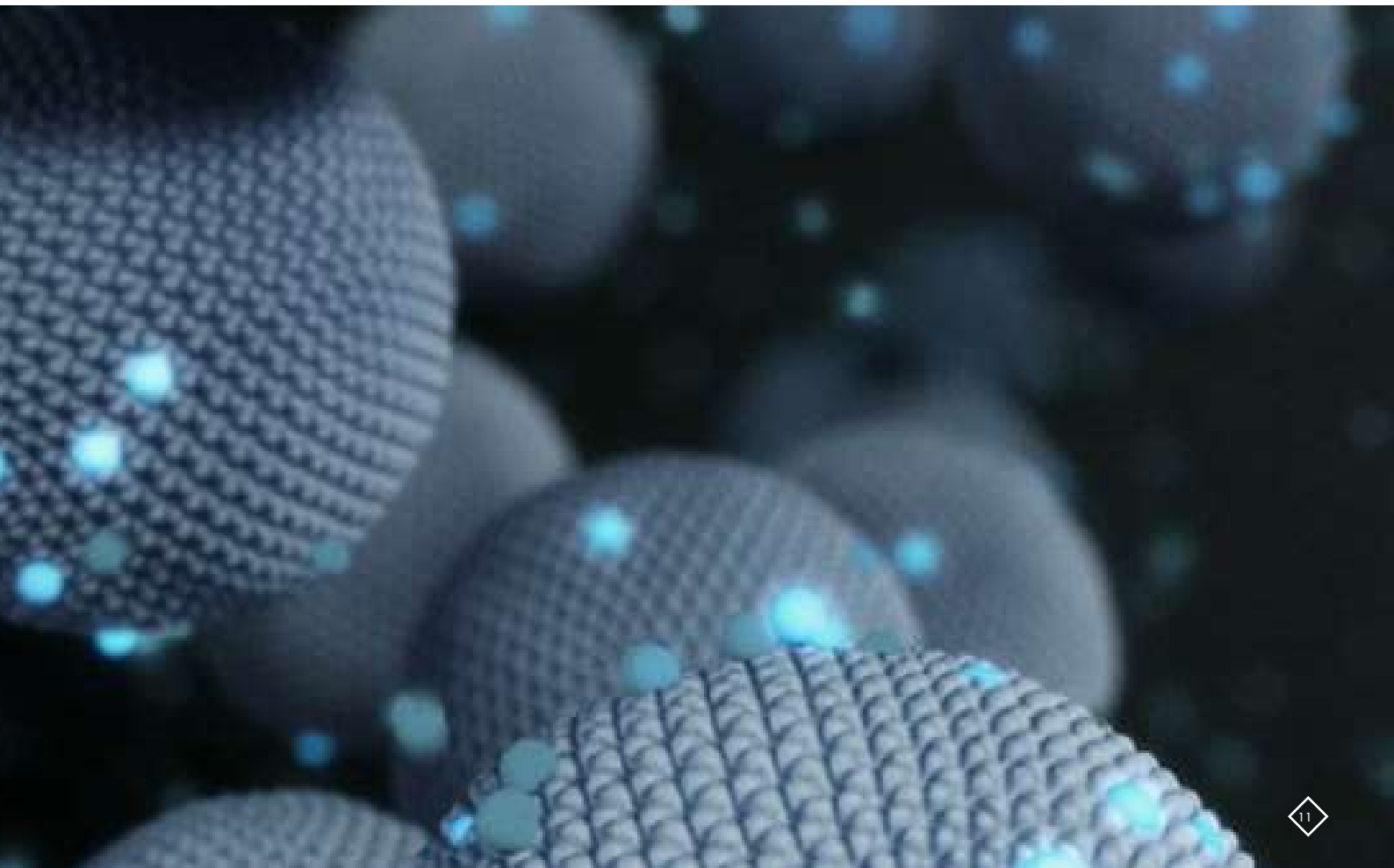
Keynote Forum- Day 01



Zhoucheng Wang
Xiamen University, China

Iron Oxide Nanostructures with Tunable Porosity and High-index Facets for Catalysis

Inorganic nanomaterials have been used in widespread applications such as nanophotonics, nanoelectronics, catalysis, energy conversion and storage, and so on. It is well known that the properties of nanomaterials largely depend on their morphology, size and surface structure. To enhance and exploit their applications, it is essential to prepare nanomaterials in a controllable manner. Many inorganic materials with different nanostructures have been successfully prepared. However, it remains a big challenge to synthesize some complex nanostructures, such as non-spherical hollow structure and structures enclosed by high index facets. Moreover, there are still lack of the fundamental understandings of the nanocrystal growth mechanisms. In this work, we will focus on the rational synthesis of complex nanostructures (e.g. non-spherical hollow structure, porous structure, high index facets structure) as well as their growth mechanisms and applications. We demonstrated two different strategies (i.e. templating method and chemical etching) to prepare α-Fe_2O_3 non-spherical hollow nanostructures. The hollowness and porosity can be easily tuned by chemical etching. Spindle- and platelet like α-Fe_2O_3 hollow structures were synthesized using a chemical etching method. The hollowness and porosity could be easily tuned by varying the amount of etchant. By comparing the performance of samples with similar morphologies and particles sizes but different hollowness and porosities, we can get an intuitive understanding of the beneficial effects of hollow and porous structures on photocatalytic activity and get a better understanding of the advantages of hollow and porous structures. We further synthesized α-Fe_2O_3 concave nanocubes enclosed by high-index {13-44} and {12-38} facets as well as hollow interiorsvia a facile hydrothermal route based on kinetically controlled overgrowth. The as-synthesized sample exhibited superior catalytic activity and high stability for low temperature CO oxidation.

Biography

Zhoucheng Wang has his expertise in materials electrochemistry and surface coating's technology. His research interests concern electrochemical processing and characterization of nano-composite materials and multi-layer coatings, energy conversion and storage, corrosion performance of metals in various environments and surface engineering. He has undertaken some projects in many areas, such as gradient functional nano-composite biomaterials, bipolar membranes and applications, corrosion and protection of magnesium alloys, etc. His research also focuses on solid state electrolyte, supercapacitor and electrocatalysis.

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Notes:

Xiaoyong Wang
Nanjing University, China

Bright-exciton fine-structure splittings in single perovskite nanocrystals

The electron-hole exchange interaction (e-h EI) is greatly enhanced in quantum-confined semiconductor nanostructures, leading to the energy-level splitting between bright- and dark-exciton states. In semiconductor epitaxial quantum dots (QDs), the dark excitons are generally nonemissive without applying a magnetic field and the bright-exciton state is further divided into two orthogonally- and linearly-polarized ones. A complete elimination of this bright-exciton FSS has been actively pursued to realize a polarization-entangled photon-pair source for fundamental tests in quantum mechanics and optics, as well as for practical applications in quantum communication. Interestingly, the dark excitons in colloidal semiconductor nanocrystals (NCs) are normally emissive, while the bright-exciton FSS was rarely observed.

Semiconductor colloidal perovskite NCs have just emerged as a novel type of semiconductor nanostructure capable of emitting single photons without the influence of dark-exciton emission [1]. Moreover, the suppressions of both the photoluminescence (PL) blinking and spectral diffusion effects were successfully demonstrated in single perovskite $CsPbI_3$ NCs [2]. Here we show that the bright-exciton FSS can be easily observed in single $CsPbI_3$ NCs at the cryogenic temperature, with an energy separation as large as hundreds of μeV between the two orthogonally- and linearly-polarized states [3]. With the laser excitation at an intermediate power, this PL doublet of neutral single exciton would switch to a single peak of singly-charged single exciton. When the laser power is further increased, PL doublets from neutral biexciton, charged biexciton and doubly-charged single exciton could be additionally observed. Based on the FSS values obtained from various exciton species, the isotropic and anisotropic e-h EI energies can be roughly estimated, which have provided valuable information on the fundamental electronic processes in these novel perovskite NCs.

Acknowledgments: *This work is supported by the National Basic Research Program of China (2017YFA0303700), the National Natural Science Foundation of China (Nos. 11574147, 91321105, 11274161 and 11621091), the Fundamental Research Funds for the Central Universities, and the PAPD of Jiangsu Higher Education Institutions.*

Biography

Xiaoyong Wang obtained his bachelor's and master's degrees of optical engineering from Tianjing University, China, and his doctoral degree in physics from University of Arkansas at Fayetteville, US. After doing his postdoctoral researches from University of Texas at Austin and University of Rochester in the US, Xiaoyong Wang took a full professor position at Nanjing University, China, and is now the chair for the department of optical science. His group is now utilizing the single-particle and ultrafast spectroscopic techniques to study various semiconductor nanostructures such as epitaxial quantum dots, colloidal nanocrystals, 2D materials and single-walled carbon nanotubes. The fundamental research projects of the group include single-photon emission, energy transfer, carrier multiplication and coherent optics of semiconductor nanostructures, the purpose of which is to facilitate their practical applications in quantum information processing and optoelectronic devices.

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Notes:

Fang Xie
Imperial College London, UK

Nanoscale engineering of plasmonic materials for biosensing and bioimaging

Early diagnosis plays an increasingly significant role in current clinical drive. Detection, identification, and quantification of low abundance biomarker proteins form a promising basis for early clinical diagnosis and offer a range of important medical benefits. Amplification of light from NIR fluorophores by coupling to metal nanostructures, i.e. Metal Induced Fluorescence Enhancement (MIFE), represents a promising strategy for dramatically improving the detection and quantification of low abundance biomarker proteins, and potentially increase already sensitive fluorescence based detection by up to three orders of magnitude. The amplification of the fluorescence system is based on interaction of the excited fluorophores with the surface plasmon resonance in metallic nanostructures. The enhanced fluorescence intensity due to the existence of metal nanostructures makes it possible to detect much lower levers of biomarkers tagged with fluorescence molecules either in sensing format or for tissue imaging. The first part of my talk will focus on some recent developments of plasmonic metal nanostructures by both "top-down" and "bottom up" methods. I will then discuss the prepared plasmonic nanostructures in the applications of biosensing and bioimaging, with the emphasis on plasmonic enhancement towards NIR I and NIR II regions.

Biography

Fang Xie is a Senior Lecturer at Department of Materials, Imperial College London. She is also Deputy Director for MSc in Advanced Materials. She has expertise in functional nanomaterials including metal, semiconducting, and oxide nanomaterials synthesis, as well as the applications of the functional materials in energy and life sciences. Her current research interests include plasmonic nanostructures for efficient light harvesting for solar cells and solar fuels, as well as in ultrasensitive biosensing and Bioimaging applications. She has over 60 publications including five patents. She has also delivered a number of keynote and invited talks in the international conferences.

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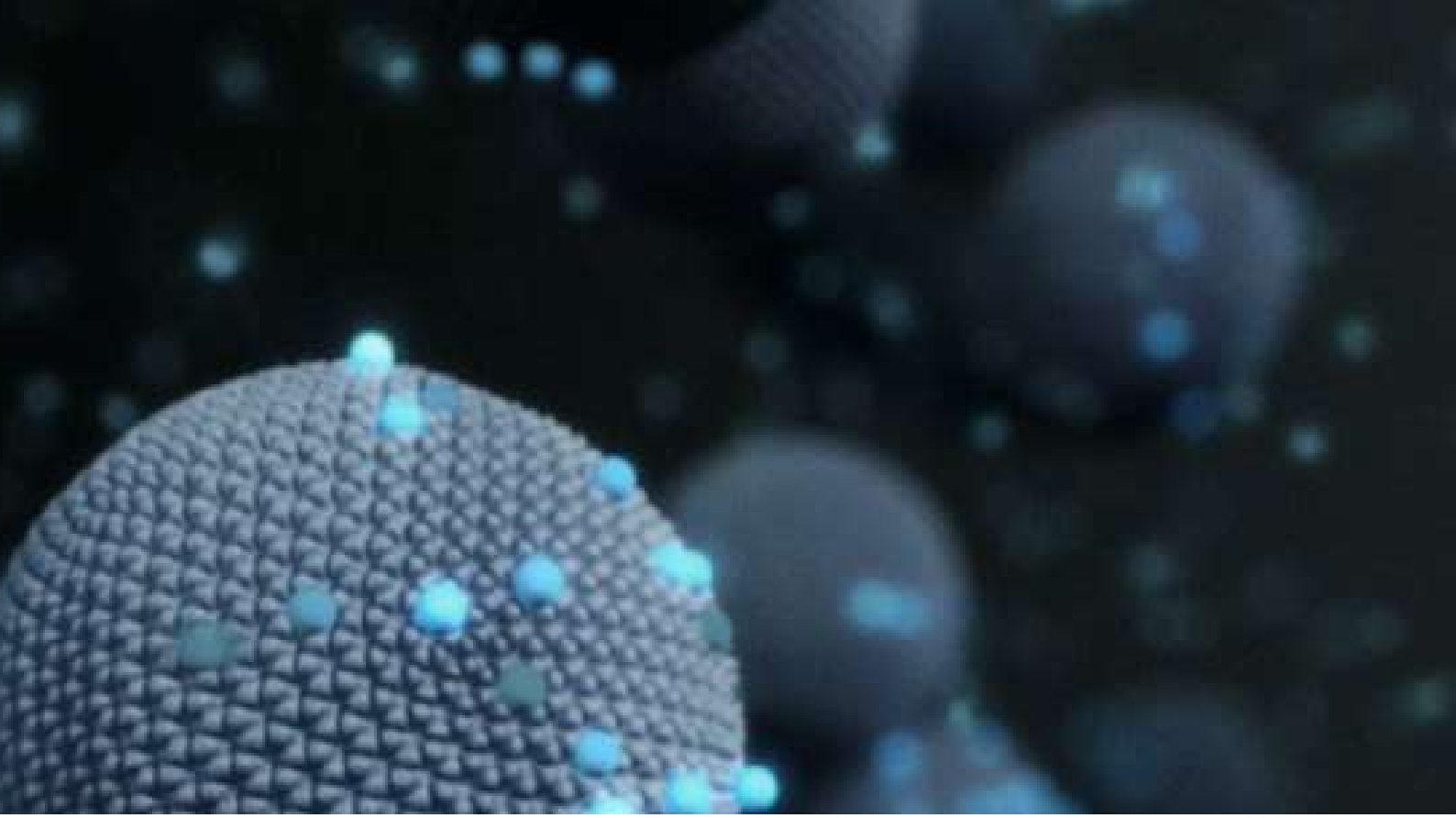

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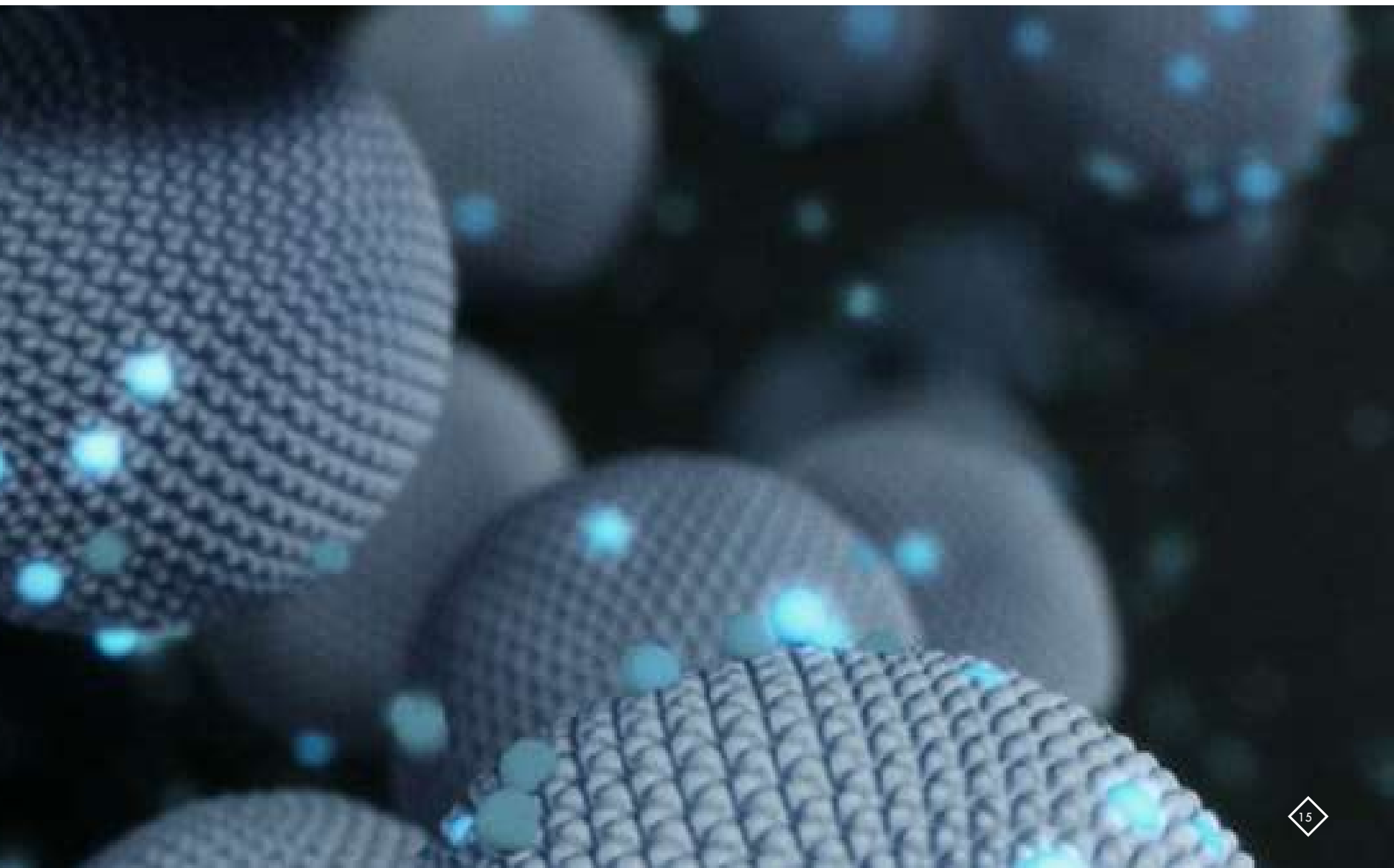
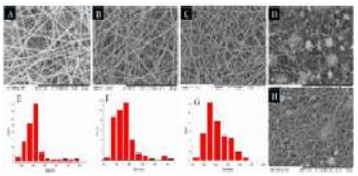
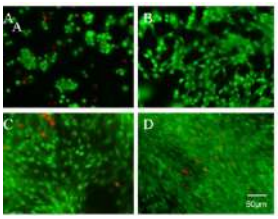


Shulin Yang & Aipeng Deng
Nanjing University of Science and Technology, China

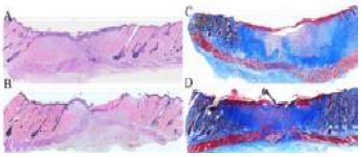
Construction of recombinant human collagen polypeptides/chitosannano-porous scaffolds for wound healing

Statement of the Problem: A tissue-engineering scaffold acts as a substitute for thenative extracellular matrix (ECM) and plays a crucial rolein tissue regeneration. Native ECM is mainly composed of nano-scale collagen fibers and proteoglycan. To mimic the structure and components of ECM, electrospinning the only method that could produce continuous fibers on the micro or nano scales was used to produce collagen and chitosan nanofibers. However, the electrospun collagen/chitosan nanofibers has been proved challenge as toxic, corrosive solvents such as hexafluoroisopropanol and trifluoroacetic acid are frequently involved. This may cause cytotoxicity during in vivo transplantation. Traditionally, after the collagen/chitosan nanofibers prepared, crosslinking is conducted to improve the properties, however this is tedious and inhomogeneous.At the same time, collagen derived from animal species, creating concerns of quality, purity, disease transmission and allergic reactions.





Methodology & Theoretical Orientation: In our lab, a reliable,predictable and chemically defined recombinant human collagen polypeptides (RHC)without allergenicity were prepared and it was used to replacecollagen. Since RHC is water-soluble, a mild electrospinning solvent prepared from diluted acetic acid and ethanol was used to makeRHC/chitosan electrospinning successful.At the same time, crosslinking in situ was applied to simplify the procedures of nanofibers preparation. Findings: By mediating the ratio of RHC, chitosan and polyethylene oxide (PEO), uniform nanofibers with 100-700 nm were prepared. In vitro study indicated that cells could maintain good viability when grew on nanofibers, and in vivo study further confirmed wounds healing could be acceleratedas nanofibers applied.



Conclusion & Significance: RHC/chitosan nanofibers are biocompatible and have potential in tissue engineering. Moreover, the simplified and cost-effective fabricating procedures could make the application successfully in large-scale.

Biography

Shulin Yang is the Professor of Institute of Environmental and Bioengineering at the Nanjing University of Science and Technology. His research is in areas of biomaterials, tissue engineering and regenerative medicine. He is devoted to researches of electrospinning nanostructures, hydrogels construction and 3D printing technology. In addition, Prof. Yang also working on cell engineering, gene engineering and fermentation engineering.

Yang received Foundation of the National High Technology Research and Development Program of China (No: 2014AA022107), Special-funded programme on national key scientific instruments and equipment development (2012YQ0401400803), et.al. He has published more than one hundred of sci papers, obtained lots of authorized patented, and has made many programs industrialize.

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Aipeng Deng is also affiliated with Nanjing University of Science and Technology, China. His research interests include Biomedical Engineering, Bioengineering and Materials Engineering.

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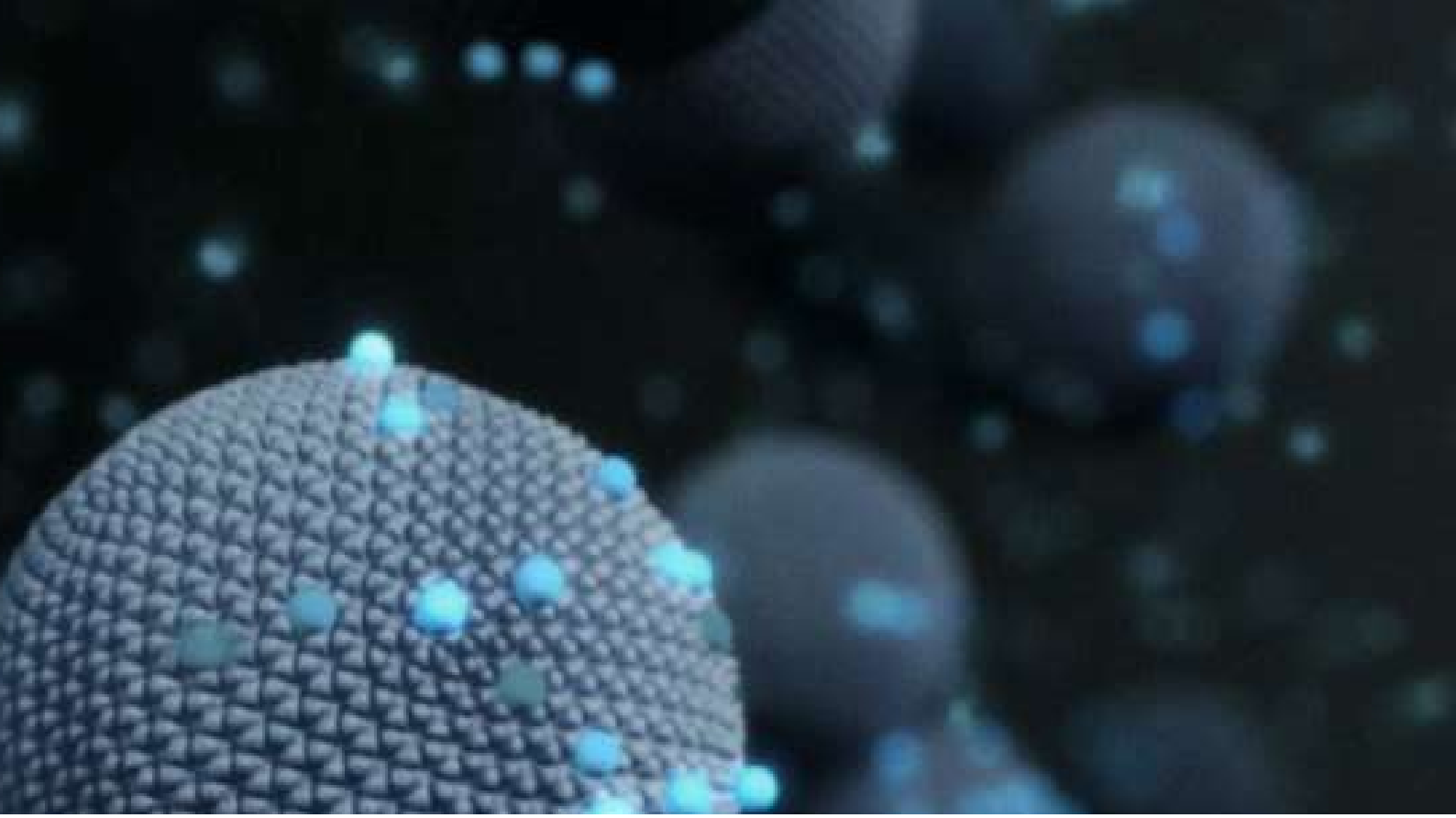

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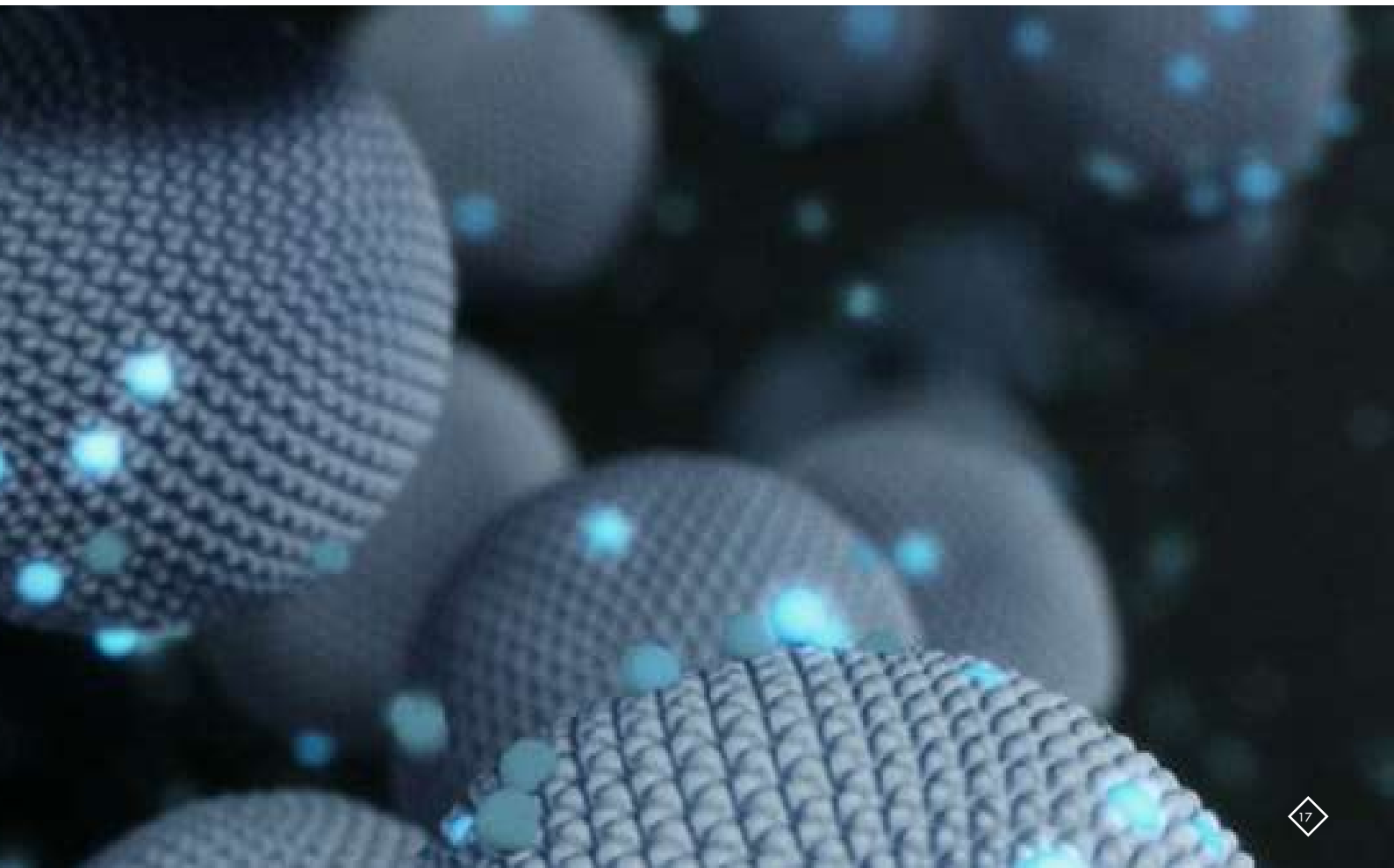

2d materials for ubiquitous electronics

Saptarshi Das
Pennsylvania State University, USA

The interest in two dimensional (2D) materials is rapidly spreading across all scientific and engineering disciplines due to their exceptional properties, which not only provide a platform to investigate intriguing physical phenomena but also promise solutions to the most relevant technological challenges. It is undisputed that silicon has been the DNA of our technological evolution for the last several decades. However, with the emergence of the era of Internet of Things (IoT), novel materials need to be mutated into the genetics of the modern technologies in order to meet the ever increasing demand of new functionalities. In this context, the 2D layered materials like MoS2, WSe2, Black Phosphorus, Graphene and many more find their application in various electronic application which includes ultra-low-power electronics, brain-inspired electronics, space electronics, anti-corrosion electronics, flexible electronics, as well as digital electronics. In fact, field effect transistors, radiation sensors, bio-detectors, optical modulators, and neuromorphic devices with superior performances have already been demonstrated based on different 2D materials. A major challenge towards the commercialization of 2D materials is the large area, scalable and controllable growth of highly crystalline monolayers in a cost effective way. In this context, chemical vapor deposition, liquid phase exfoliation and electrochemical synthesis approaches are showing a lot of promise. My talk will provide a holistic understanding of 2D materials starting from large area synthesis to device fabrication to different electronic, optoelectronic and neuromorphic applications.

Biography

Saptarshi completed BE degree (2007) in Electronics and Telecommunication Engineering (ETCE) from Jadavpur University, India and PhD degree (2013) in Electrical and Computer Engineering (ECE) from Purdue University, USA. He worked at the Department of Defense's Argonne National Laboratory as a postdoctoral research scholar during 2013-15 and as an Assistant Research Scientist during 2015- 16. He joined the Department of Engineering Science and Mechanics (ESM) and Material Research Institute (MRI) at the Pennsylvania State University as an Assistant Professor from January, 2016. His research group primarily focuses on the experimental investigation of novel nano materials (especially 2D materials like MoS2, Black Phosphorus, Graphene and 1D materials like CNTs and Nanowires) for innovative device ideas. His research group (https://sites.psu.edu/sdas/) works on high performance and low power electronics, flexible electronics, optoelectronics, bioelectronics and energy harvesting devices.

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Notes:

In-silico modeling of degrading nanomaterials as a novel approach for tumor therapy

Stefaan J Soenen[1,2], Manshian BB[1,2], Pokhrel S[3], Himmelreich U[2], Tämm K[4], Sikk L[4], Fernández A[5], Rallo R[5], Tamm T[4], Mädler L[3]
[1]NanoHealth and Optical Imaging Group, Belgium
[2]Department of Imaging and Pathology, Belgium
[3]University of Bremen, Germany
[4]University of Tartu, Estonia
[5]Universitat Rovira i Virgili, Spain

Here, our aim was to develop ZnO NMs with finely tuned degradation kinetics in order to maximize cancer-cell specific cell death. ZnO NMs were doped with different levels of Fe ions. Based on the intrinsic physicochemical properties of the NMs, quantitative nanostructure-activity relationship models were generated to define the dissolution rate and cell death of the different NMs and to generate an optimal formulation for toxic-by-design NMs that could selectively kill cancer cells while non-cancerous cells remained unaffected. Cytotoxicity of these NMs was tested in HeLa and KLN 205 (cancerous), MSC and BEAS-2B (non-cancerous) cell lines. Data revealed that low Fe-doping caused higher overall toxicity that was diminished as the Fe-doping increased. In-silico analysis revealed that 2% Fe-doped NMs were the most selective towards cancer cells. These findings were confirmed in co-culture models where cancer cells were cultured with non-cancerous cells and exposed to the NMs. This was further evaluated in a syngeneic mouse model (DBA/2 mice with subcutaneous KLN 205 cells). Upon administration of pure, 2%, or 10% Fe-doped ZnO, the level of Zn^{2+} ions present in the tumor were inversely correlated to the Fe-doping level. The pure ZnO NMs were found to be toxic to the mice, while 10% Fe-doped NMs did not cause any toxicity nor a major therapeutic benefit. However, 2% Fe-doped NMs resulted in a clear reduction in tumor growth, without any negative effect on animal well-being. Thus, we have demonstrated that through controlled dissolution and in-silico modelling, NMs can be generated that cause selective cancer cell toxicity.

Biography

Stefaan J Soenen is from NanoHealth and Optical Imaging Group at KU Leuven. He was awarded an ERC Starting Grant (NanOnc), excellence in science professorship and am scientific coordinator of the optical imaging section in the Molecular Small Animal Imaging Center (MoSAIC). His research focuses on studying the biological behavior of nanomaterials for biomedical purposes focusing on the development of high-throughput cytotoxicity models optimized for nanoparticle analysis and the use of in-vivo optical imaging methods for studying the biodistribution and therapeutic efficacy of NMs. His work involves developing novel ways for optimizing NM mediated anti-cancer therapy through alternative therapeutic approaches or by increasing delivery of NMs to the tumor site.

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Notes:

A personalized approach for the delivery of nanomaterial based cancer therapeutics

Bella B Manshian[1,2], Uwe Himmelreich[2], Stefaan J Soenen[1,2]
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[2]Molecular Small Animal Imaging Center, Belgium

Cancer drug concentrations are calculated based on individual's weight. In nanotherapy this does not always lead to optimal therapeutic results. Thus, we aimed to correlate the nanoparticleconcentration to the size and metabolic activity of the individual tumor. Here, the cytotoxicity of CdTe quantum dots (QDs)was evaluated using ahigh content imaging approach for evaluating bio-nano interactions. *In-vivo*, the exposure of the mouse lung tumor cells (KLN 205) to 13.91*107 NPs/cell resulted in 20% acute (at 24 h) cell death while 10% acute cell death was achieved with 10.43*107 NPs/cell. We then used non-invasive optical imaging to determine the metabolic activity of the individual tumor, in a syngeneic tumor model (in DBA2 mice), based on which we provided fluorescent QDs at toxic levelsat personalized concentration and at a general average dose. The animals were either given saline (control animals) or saline containing 435 or 318 μg QDs (standard reference groups GHequal (20% cell death) and GLequal, (10% cell death) respectively), or 362–480 or 269–361μg QDs personalized medicine groups GHRel (20% cell death) and GLRel, (10% cell death), respectively).The results showed impeded growth for all treated tumors compared to control animals. Only animals with personalized dosages displayed significant effects even at low QD concentrations, while at average dosages these results were obscured due to high variability. Furthermore, tumor therapeutic activity could be monitored using noninvasive imaging as anticancer efficacy correlated with loss in fluorescence intensity thusfacilitating the monitoring of therapeutic delivery and optimal NP-mediated cancer treatment via personalized medicine.

Biography

Bella research focuses on nanotoxicology and the manipulation of nanomaterials for in-vivo theranostic applications. She has been using multimodal and multiparametric in-vivo imaging, of mainly preclinical animal models, to assess disease mechanisms and therapy accompanied with screening of individual nanoparticle toxicity, the mechanisms involved and cellular-nanoparticle interaction kinetics. Her interest is in developing non-invasive methods for the dual function of visualization and tracking of specific cell types with a strong focus on tumor cell, stem cell, immune cell and beta cellswhile simultaneously delivering therapeutic agents. She has over 42 publications plus 3 book chapters (H index: 16, 1445 citations).

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Green Technology

Andreas Nicholas
ST GO LAB Inc., USA

S†Go Lab is a nanotechnology and AI research company, focused on the development of Green Energy solutions aimed at ensuring a better life for people around the world. Currently tackling the water purification challenge, we aim to bring sustainable solutions for a better future. As water is Earth's most precious resource, we have dedicated time to use these nanotechnologies to filter water, restore natural habitats and preserve endangered flora and fauna, while maintaining harmony throughout the Biosphere. Nano-filters will provide water to the thirsty, while purifying the waste of the mining and agricultural industries. These materials will also be used to monitor the health of billions of people and contribute toward a more sustainable, industrial Tomorrow.

Biography

Andreas Nicholas is a material science manufacturing engineer, specialized in Nanotechnology, who leads the design of water filtration systems with S†Go Lab. Originally from Santa Cruz, California, after having lived in South America and Europe, he focuses on the technology available for new alternative uses and environmental solutions. In 2012, Andreas discovered an economic method of graphene ablation, offering a new and economical world of applications for this cutting-edge material.

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Fabrication of Polycaprolactone (PCL) graphene nanocomposites by solution intercalation

Kamal Yusoh and Tan Li San
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Recently, biodegradable polymers like polycaprolactone (PCL) gain the attraction from the researchers because non-biodegradable fossil fuel based polymers lead to many waste and environmental issue. However, low glass transition temperature, low mechanical property, high permeability and slow crystallization rate restrict PCL to be used in a wide range of applications. Therefore, the innovation of PCL nanocomposites with good mechanical, thermal, barrier and degradable properties is highly demanded by the market. In order to achieve this objective, a study of graphene as the nanofiller for PCL matrix was carried out to determine the weight percentage that will produce the nanocomposites with the optimum degradable and barrier properties. PCL/graphene nanocomposite was fabricated by using solution intercalation method. Then, characteristics analysis of the nanocomposite was done by Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD) and Field Emission Scanning Electron Microscopy (FESEM). In morphological analysis, nanocomposite with 0.01 wt% and 0.05 wt% of graphene show better exfoliation and intercalation with PCL matrix. Weathering test was carried out by using Accelerated Weathering Tester to indicate the photodegradable properties of nanocomposite. The additional of graphene to PCL matrix not affect the initial photodegradable ability of PCL. Meanwhile in chemical degradation test conducted by using 10% hydrochloric acid and 10% sodium hydroxide, PCL with 0.05 wt% of graphene possessed the best chemical resistance towards acid and basic conditions. Water vapour permeability test was used to predict the barrier properties. All nanocomposite samples show significant improvement in reduce the permeability. The addition of small amount graphene is able to reduce up to 80% of PCL permeability. In summary, PCL with 0.05 wt% of graphene show the best improvement in all the properties tested, while nanocomposite with 0.10 wt% of graphene presented poorer result due to the agglomeration of graphene.

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Aminothymoquinone and curcumin dye sensitized solar cells

Mehboob Nagarbawdi[1] and Sohail Bagwan[2]
[1]Poona College, India
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Dye-sensitized solar cells (DSSC) based on natural sensitizers have become a topic of significant research because of their importance in the field of energy conversion. In our study we have used curcumin and aminothymoquinone ar natural dye sensitizers. Aminothymoquinone is an important constituent of Nigella Satvia. It is very important light sensitizer. The dye molecules are absorbed by TiO_2 nanoparticles at the surface, when submerged in the solution for 24 hrs. When illuminated under 80W/cm^2 intense light the photovoltaic properties were investigated and the current density-voltage characteristics and current conversion efficiency measurements were carried out. The short-circuit current (Isc), open circuit voltage (Voc), Fill factor (FF) and efficiency (η) for both the dyes were determined. Comparatively the aminothymiquinone dye as light harvesting material was found to be a more promising candidate for future solar cells. Further being natural dyes both these have minimum impact on the environment.

Biography

Mehboob Nagarbawdi is an erudite academician with high calibre and extensive experience of over 27 years, developing results driven curriculum and delivering enthusiastic instruction of Physics principles to students. Thirty five students have completed research, under my supervision in Material Science. He Published books on "ELEMENTS OF MATERIAL SCIENCE, QUANTUM MECHANICS, PHYSICS OF NANOMATERIALS and ELECTRONICS." He also Contributed as a Resource Person at several International / national / state level as well as university level seminars/ conferences/ workshop/ symposia.(Turkey, Thailand, Malaysia, Goa). He Participated and presented paper International / national / state level as well as university level seminars/ conferences/ workshop/ symposia. He is a Chairman of Science and Technology Advisory Committee, Indo Global Chamber of Commerce, Agriculture and Industries.

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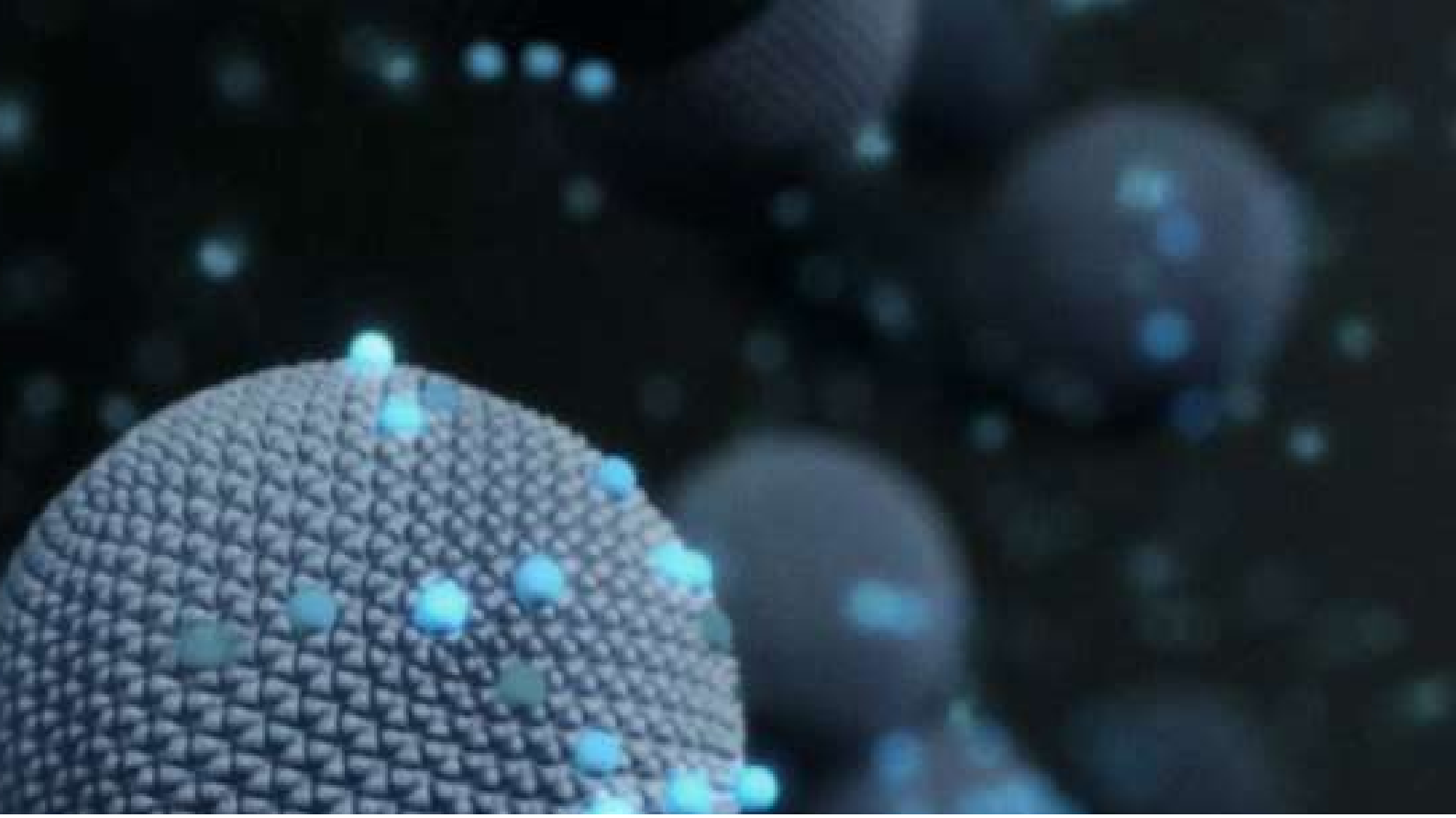

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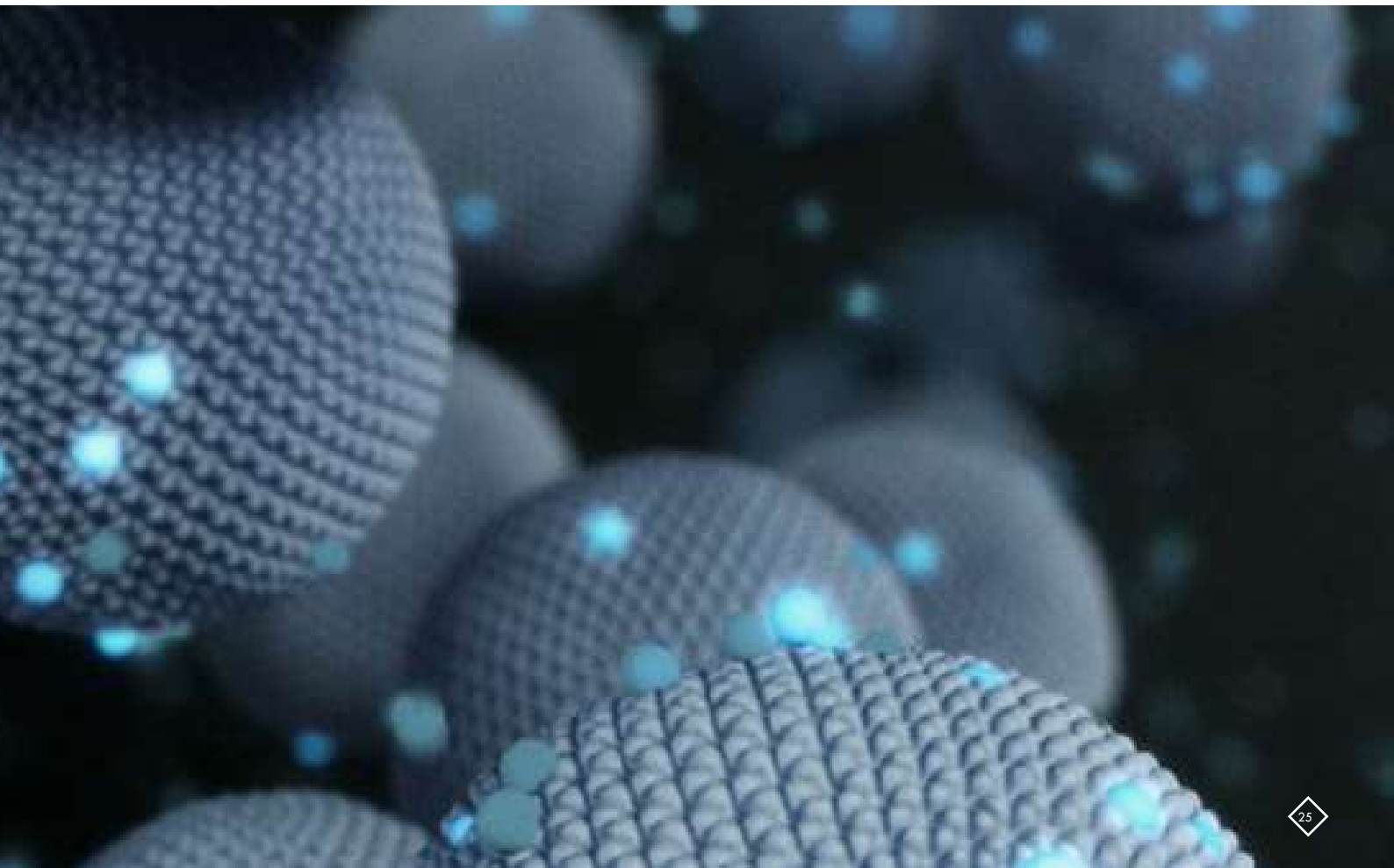

Jean-François PERRIN
Chairman and CEO, Nanomakers, France

Nano-particles for high-perf' EV batteries and lightweight vehicles

Size is of the essence. Just see two very different applications examples of nano materials:

1. High capacities Li-ion batteries for EV : the existing Li-ion technology uses graphite. Nanomakers silicon particles enable the manufacturing of high capacities (x2-3) Li-ion batteries anodes along with a high capacity retention along cycling (up to 500 cycles). For silicon anodes, various formulations are studied which do not change the anode preparation existing processes. The carbon coating of the particles improves the anode performances during cycling, especially the capacity stability.

2. Aerospace devices and automotive lightening : University of Wisconsin and Eck Industries issued a proof of concept of a fine dispersion of silicon carbide nanoparticles into melting aluminium. Multiple mechanical benefits (improved tensile and fatigue strength, improved stiffness, improved fracture toughness) of the use of Nanomakers nano-silicon carbide, have been demonstrated, compared to their micrometer sized alternatives. Based on the powder metallurgy route, the HIPERCO project (financed by EIT Raw Materials) is developing an innovative silicon carbide / aluminium nano-composite powder for additive manufacturing. Those silicon-based particles are produced with a very narrow particle size distribution by a laser pyrolysis process developed by CEA. This process is reproducible, robust and the particles have low oxygen and very low impurities contents. This presentation details the "nano-effect" : how nano materials bring much more than the coarse form of the same materials.

Biography

An engineer with a PhD, Jean-François Perrin has over twenty years experience in GM positions in innovative industries, particularly for the development of new activities and the implementation of industrial production facilities in an international environment. He worked in large international groups (Siemens, Saint-Gobain, Suez-Environment) but also in SMEs. He has been the CEO of MPO Energy, a start up devoted to designing and manufacturing innovative photovoltaic cells.

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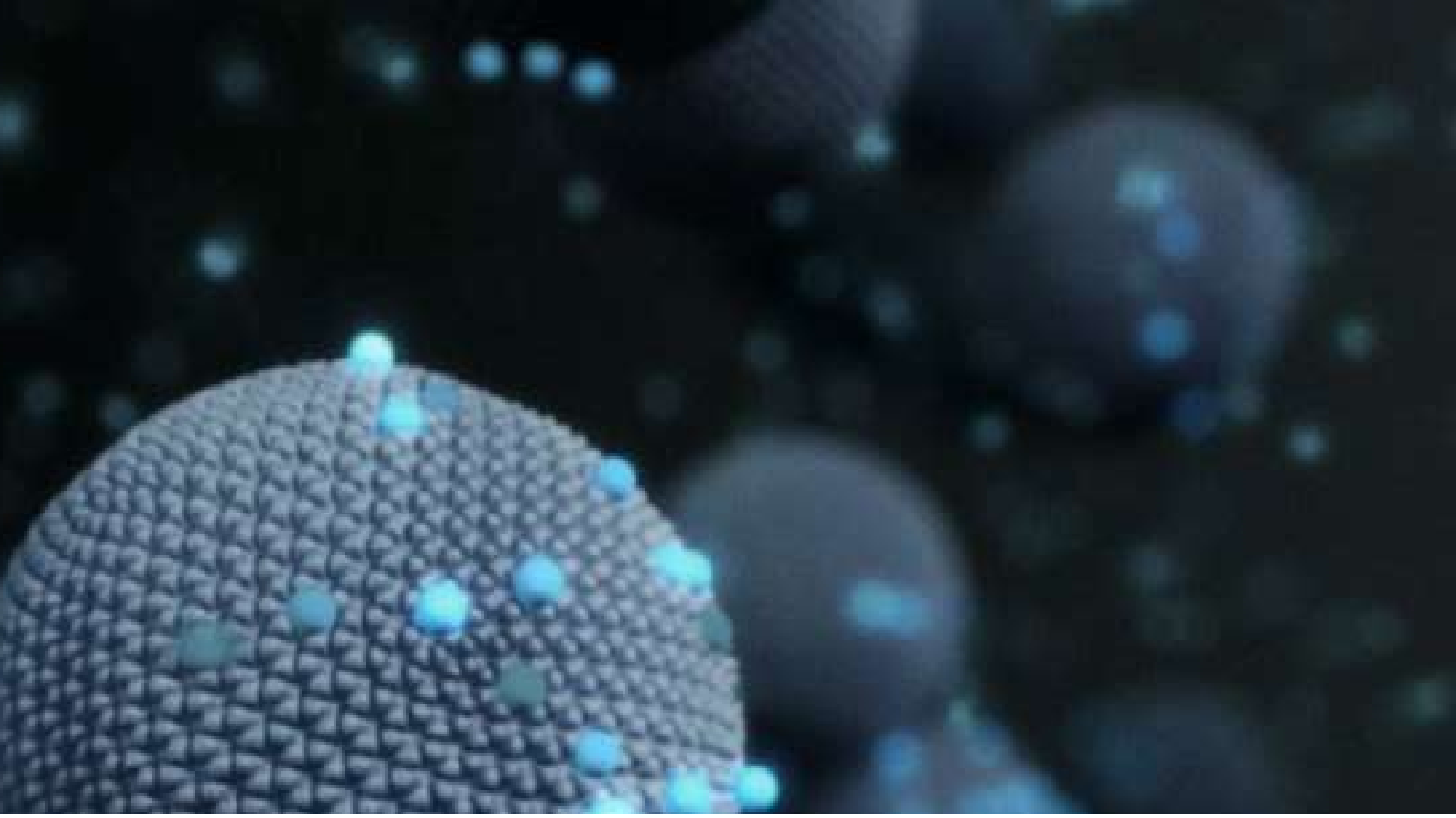

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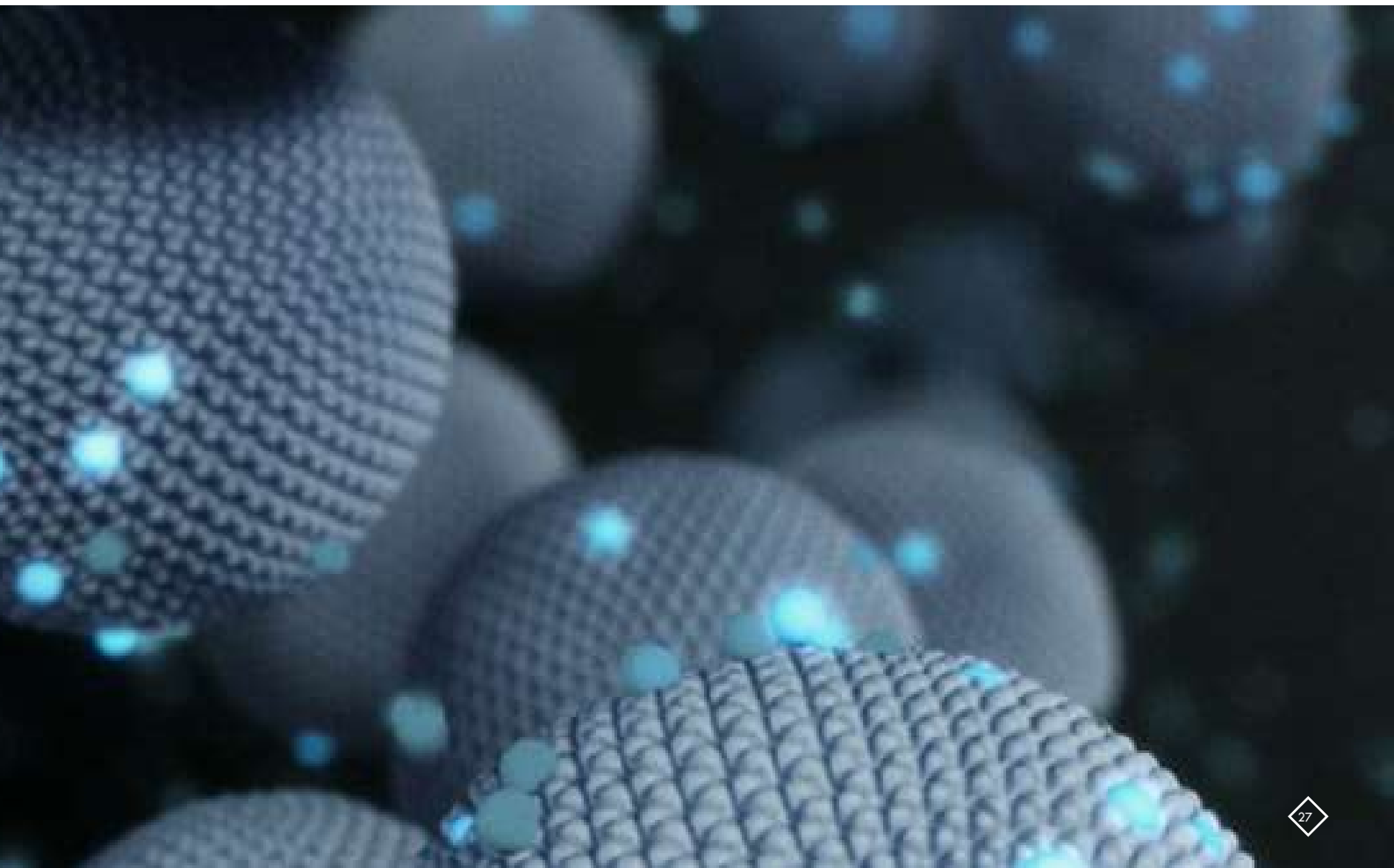

Monolithic 3D self-rolled-up membrane nanotechnology for high integration level RF and power electronics applications

Wen Huang
Hefei University of Technology, China

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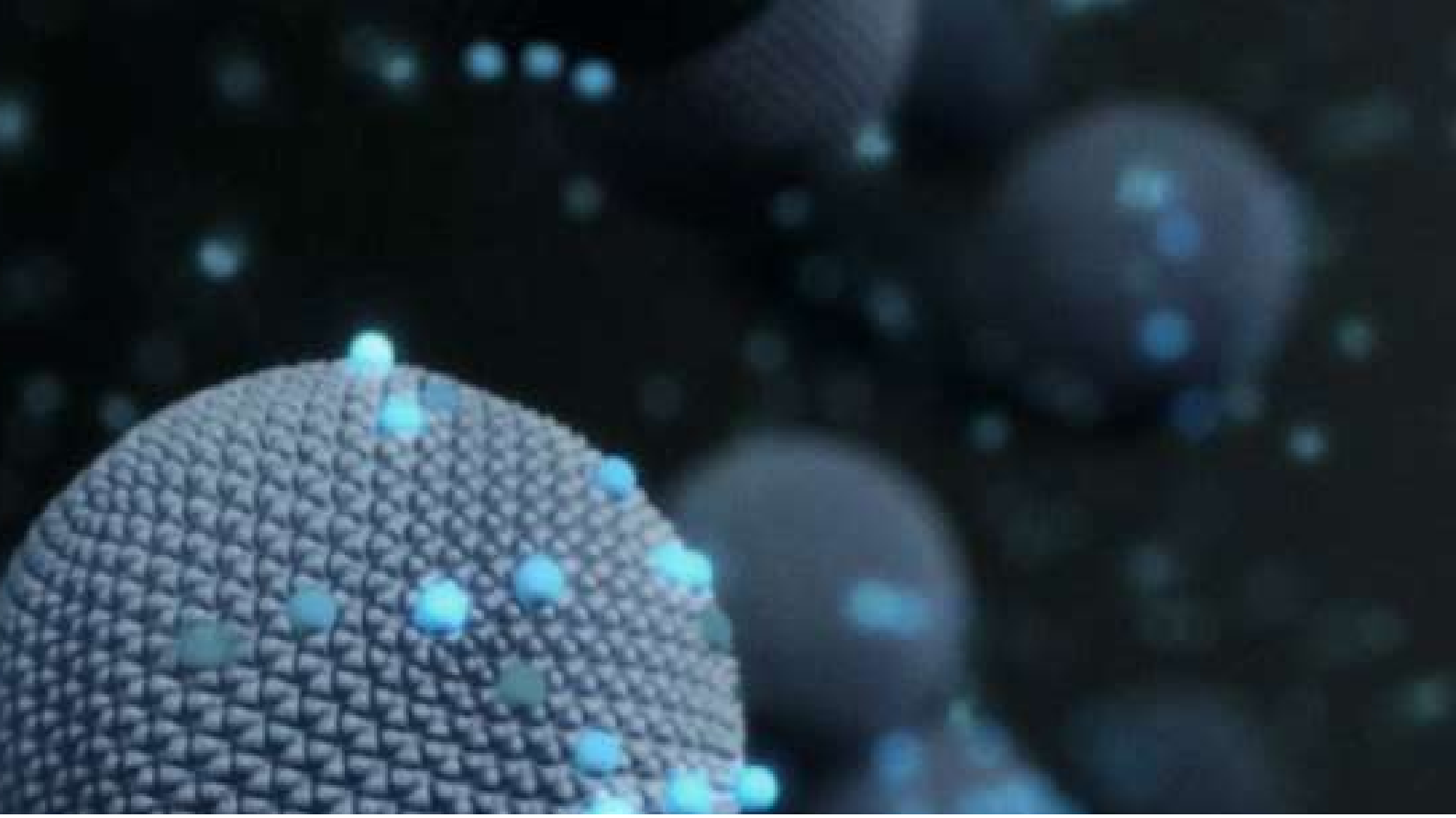
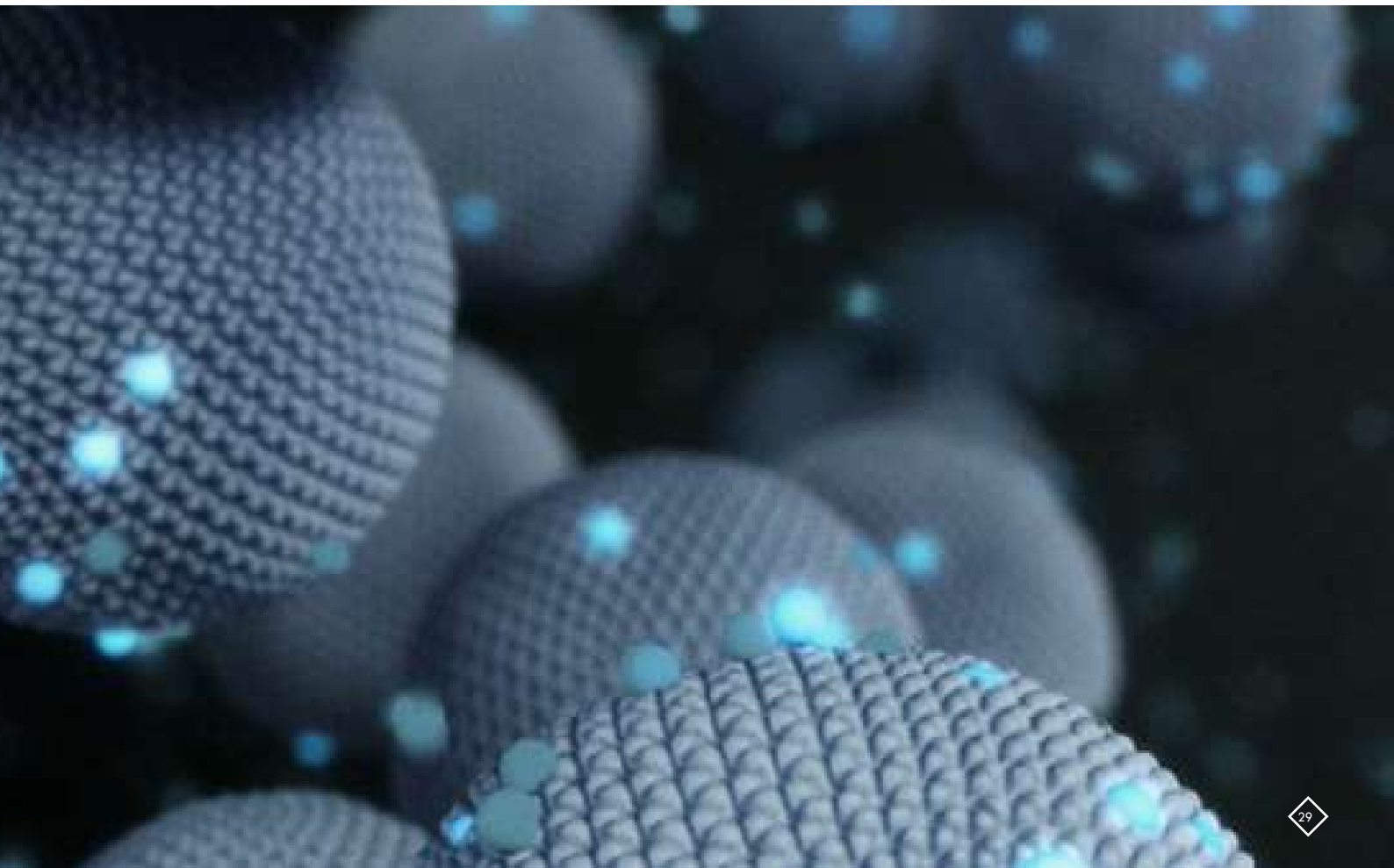


2nd Global Summit and Expo on

Nanotechnology and Material Science

August 27-28, 2018 | Rome, Italy

Speakers- Day 02



High-k oxides coatings with antibacterial properties – new application in medicine

Anna Słońska-Zielonka[1], Joanna Cymerys-Bulenda[2], Rafał Pietuszka[3], Michał M Godlewski[1], Marek Godlewski[3]
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The increasing resistance of bacteria to antibiotics has become the dominant problem on a global scale and a serious challenge for modern medicine. For that reason, it is very important to develop new, effective and low-cost technologies enabling the development of new strategies aimed at the elimination of pathogenic bacteria. Recently, special attention has been paid to high-k oxides and their antibacterial properties, due to which they can find new application in biology, medicine and food industry.

Atomic layer deposition (ALD) allows deposition of the thin films of high-k oxides on various materials, including temperature sensitive ones (e.g., perishable fabrics), equipment and instruments (including implants) used in hospitals. In the current study we evaluated the antibacterial properties of various high-k oxides (ZnO, HfO_2, TiO_2, ZrO_2, Al_2O_3, AZO) deposited by the ALD. Testing of antimicrobialaction was performed according to the agardisk diffusion method, commonly used to determine the sensitivity of bacteria to antibiotics. Paper discs coated with high-k oxidesnanolayerwere placed on the surface of the bacteria-covered medium. In the experiment reference bacterial strains, as well as wild serotypes were used. The efficiency of antibacterial properties of high-k oxides was evaluated by the extent of the area in which bacteria growth was inhibited.

In conclusion, antibacterial nano-coatings are a new alternative (to disinfectants and antibiotics) that could help to reduce the number of infections. Moreover, the low temperature of layer deposition opens a possibility to coat various multidimensional materials, such as soft tissue paper, fabrics, surgical instruments and other implements, thus promising a range of new potential applications in medicine, veterinary and broader health care.

Acknowledgments: *The research was partially supported by the National Centre for Research grants "Maestro" 2012/06/A/ST7/00398 and "Sonata-Bis" UMO 2012/05/E/NZ4/02994 supported by the grant from 05-1/KNOW2/2015 "Healthy Animal-Safe Food".*

Biography

Anna Słońska-Zielonka, PhD is currently the Post-doc Researcher at the Faculty of Veterinary Medicine, WULS-SGGW. She defended the PhD in 2013. Her recent scientific interest relate to the development of nanoparticles for bio-medical applications. She is author / co-author of 33 papers in the WoS database and 3 chapters in academic monographies, cited over 100 times. 23 national and international prizes and medals for innovation (in 2012-2017) reflect the relevance of her research.

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Notes:

Antibacterial printing vanishes – new application in food industry

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Contamination of food with pathogenic microorganisms causing food-borne diseases poses a real threat to human health. One of the methods to reduce the food contamination is the use of food packaging with antibacterial properties (active packaging). They prevent adverse changes in food quality by destroying microorganisms or inhibiting their growth. Hence, we proposed application of nanopowders with antibacterial properties introduced to the polygraphicvanishes used to seal the surface of printed materials. Zinc oxide, nanoparticles with confirmed antibacterial properties in substantia / in nanolayer, were added to the commercial vanishes of either aqueous (ABV, dispersive vanish) or organic (OBV, offset vanish) solvent base. They were printed on 240 g/m^2 paper sheets and then cut in sterile conditionsinto 1cm^2 samples. Antibacterial properties were checked withthe agar disk diffusion method using reference and wild-type (isolated from the clinical cases) bacterial serotypes. Samples were placed on the surface of the bacteria-covered medium. The efficiency of antibacterial activity of varnishes mixed with zinc oxide was measuredas the extent of the area inwhich bacteria growth was inhibited. Varnish layers with the addition of ZnO nanoparticles showedantibacterial / bacteriostatic activity against common bacterial strains, bothopportunistic, pathogenic and common bacteria causing losses in the food industry. According to the obtained results we can conclude that the addition of ZnO to the vanishes add antibacterial properties to the final print. Nanoparticles-enhanced vanishes showed antibacterial and bacteriostatic properties; therefore it can find potential applications in medicine, broader health care, and food industry.

Acknowledgments: *The research was partially supported by the National Centre for Research grants "Maestro" 2012/06/A/ST7/00398 and "Sonata-Bis" UMO 2012/05/E/NZ4/02994 supported by the grant from 05-1/KNOW2/2015 "Healthy Animal-Safe Food".*

Biography

Anna Słońska-Zielonka, PhD is currently the Post-doc researcher at the Faculty of Veterinary Medicine, WULS-SGGW. She defended the PhD in 2013. Her recent scientific interest relate to the development of nanoparticles for bio-medical applications. She is author / co-author of 33 papers in the WoS database and 3 chapters in academic monographies, cited over 100 times. 23 national and international prizes and medals for innovation (in 2012-2017) reflect the relevance of her research.

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Clean energy for cooling and heating with ground source heat pumps

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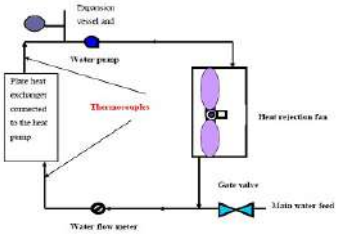
In the recent attempts to stimulate alternative energy sources for heating and cooling of buildings, emphasise has been put on utilisation of the ambient energy from ground source heat pump systems (GSHPs) and other renewable energy sources. Exploitation of renewable energy sources and particularly ground heat in buildings can significantly contribute towards reducing dependency on fossil fuels. The study was carried out at the Energy Research Institute (ERI), between September 2016 and November 2017. This paper highlights the potential energy saving that could be achieved through use of ground energy source. The main concept of this technology is that it uses the lower temperature of the ground (approximately <32°C), which remains relatively stable throughout the year, to provide space heating, cooling and domestic hot water inside the building area. The purpose of this study, however, is to examine the means of reducing of energy consumption in buildings, identifying GSHPs as an environmental friendly technology able to provide efficient utilisation of energy in the buildings sector, promoting the use of GSHPs applications as an optimum means of heating and cooling, and presenting typical applications and recent advances of the DX GSHPs. It is concluded that the direct expansion of GSHP are extendable to more comprehensive applications combined with the ground heat exchanger in foundation piles and the seasonal thermal energy storage from solar thermal collectors. This study highlights the energy problem and the possible saving that can be achieved through the use of the GSHP systems. This article discusses the principle of the ground source energy, varieties of GSHPs, and various developments.



Biography

Abdeen Mustafa Omer (BSc, MSc, PhD) is an Associate Researcher at Energy Research Institute (ERI). He obtained both his PhD degree in the Built Environment and Master of Philosophy degree in Renewable Energy Technologies from the University of Nottingham. He is qualified Mechanical Engineer with a proven track record within the water industry and renewable energy technologies. He has been graduated from University of El Menoufia, Egypt, BSc in Mechanical Engineering. His previous experience involved being a member of the research team at the National Council for Research/Energy Research Institute in Sudan and working director of research and development for National Water Equipment Manufacturing Co. Ltd., Sudan. He has been listed in the book WHO'S WHO in the World 2005, 2006, 2007 and 2010. He has published over 300 papers in peer-reviewed journals, 200 review articles, 15 books and 150 chapters in books.

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Biological study of some first series transition metal complexes with adenine ligand

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Adenine complexes were prepared with some of the first series transition metals in a stoichiometric ratio of 1 : 2 (M^{n+}: L), where M^{n+} = Mn^{2+}, Fe^{3+}, Co^{2+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, and Cd^{2+} ions. The Complexes were characterized by the physicochemical and spectroscopic techniques as electric conductivity, metal contents, IR, UV–Visible, and molar conductance techniques. The stoichiometric ratios of the synthesized complexes were confirmed by using molar ratio method. The dissociation constant of adenine ligand was determined spectrophotometrically. Solvent effect on the electronic spectra of the adenine ligand was examined using solvents with different polarities. The biological activity of adenine ligand and its metal complexes were tested in vitro against some selected species of fungi and bacteria. The results showed a satisfactory spectrum against the tested organisms.

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Notes:

Preparation of high loft electrically conductive activated carbon web from acrylic waste for EMI shielding applications

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Introduction: In recent years, research on electromagnetic interference (EMI) shielding materials has attracted significant attention due to increase in electromagnetic population from widespread applications of computer and telecommunication technologies [1, 2]. For eco-friendly advancements in EMI shielding effectiveness,the development of new light weight shielding materials havingstrong absorption and weak secondary reflection is necessary. This can be achieved by porous morphology, large specific surface area and higher electrical conductivity of shielding materials [3,4]. Although number of research studies focused on developmentof porous carbon based EMI shielding materials, the construction oflightweight structures with excellent EMI shielding properties bysimple and affordable method is still a big challenge. This workpresented the simple and novel method for preparation of porousand electrically conductive activated carbon nonwoven web fromacrylic fibrous wastes. The prepared activated carbon is advantageous over carbon made from other materials because of low cost,high density, better purity, and virtually dust-free nature of acrylicfibers [5].

The activated carbon web was prepared by sequentialaction of carding, thermal bonding with bi-component fibers and physical activation of acrylicfibrous web in presence of air. The carbonization was performedunder the layer of charcoal at 800°C, 1000°C and 1200°C with the heating rate of 300°C h-1 and without any holding time. Further,electrical conductivity, EDX, X-ray diffraction, SEM, X-ray tomography and BET analysis was carried out to study the effect ofcarbonization temperature on physical and morphological properties of activated carbon web. At the end, the electromagneticshielding ability of the produced three webs was investigated with respect to change in carbonization temperature and thickness ofmaterial using two different measurement approaches (i.e. waveguide method and coaxial transmission line method).

Results and Discussion: The physical properties of acrylic fibrous and high loft activated carbonnonwoven webs were determined in terms of shrinkage, flexibilityand dusting tendency as can be seen from table 1. The techniques of X-ray diffraction (XRD) analysis, Energy dispersive x-ray (EDX) analysis and Scanning Electron Microscopy were performed for in depth analysis of high loft AC webs prepared at different temperature.

Effect of carbonization temperature on physical properties of high loft AC web

Temperature (°C)	Yield (%)	Shrinkage	Flexibility	Dusting
800	61.7	Good	Good	Good
1000	57.6	Good	Average	Average
1200	45	Average	Poor	Poor

The electrical conductivity and EMI shielding was found to increase as the temperature for carbonization was increased. The higher EMI shielding results came from AC web prepared at 1200 oC (around 70 dB) because at high temperature more parallel orientation of chains and high degree of crystallinity as can be seen from figure 1.

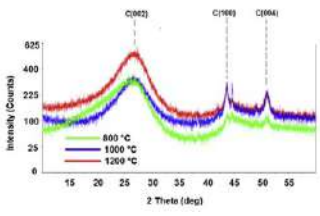

Fig 1. Effect of carbonization temperature on crystallinity of AC webs

The range for EMI shielding for activated carbon webs prepared at different temperatures can be seen from figure 2. The EMI shielding was checked at three different frequencies (600MHz, 1 GHz, and 1.5 GHz).

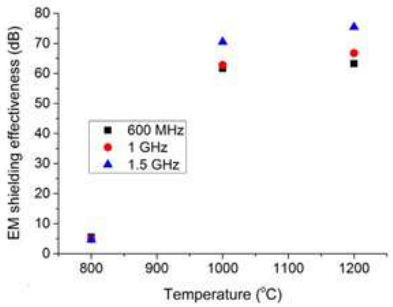

Fig 2. Effect of frequency on EM shielding effectiveness of AC webs

Conclusion: The present study was focused on development of porous andelectrically conductive activated carbon based electromagneticshielding materials from acrylic fibrous wastes. The simple andnovel approach was employed to introduce absorption and reflection properties of electromagnetic radiations into the shieldingmaterials. This was achieved by physical activation of thermal bonded high loft nonwoven web of acrylic fibers.

Biography

Muhammad Salman Naeem had done his PhD from department of Material Engineering, Technical University of Liberec under the kind supervision of Professor Jiri Militky. The topic of his PhD work is ''Development of activated carbon web from acrylic fibrous waste''. He has 11 impact factor publications, 10 book chapters and 17 international conferences. Currently he is working as Assistant Professor in National Textile University, Pakistan. He is involved in teaching activities since December 2009.

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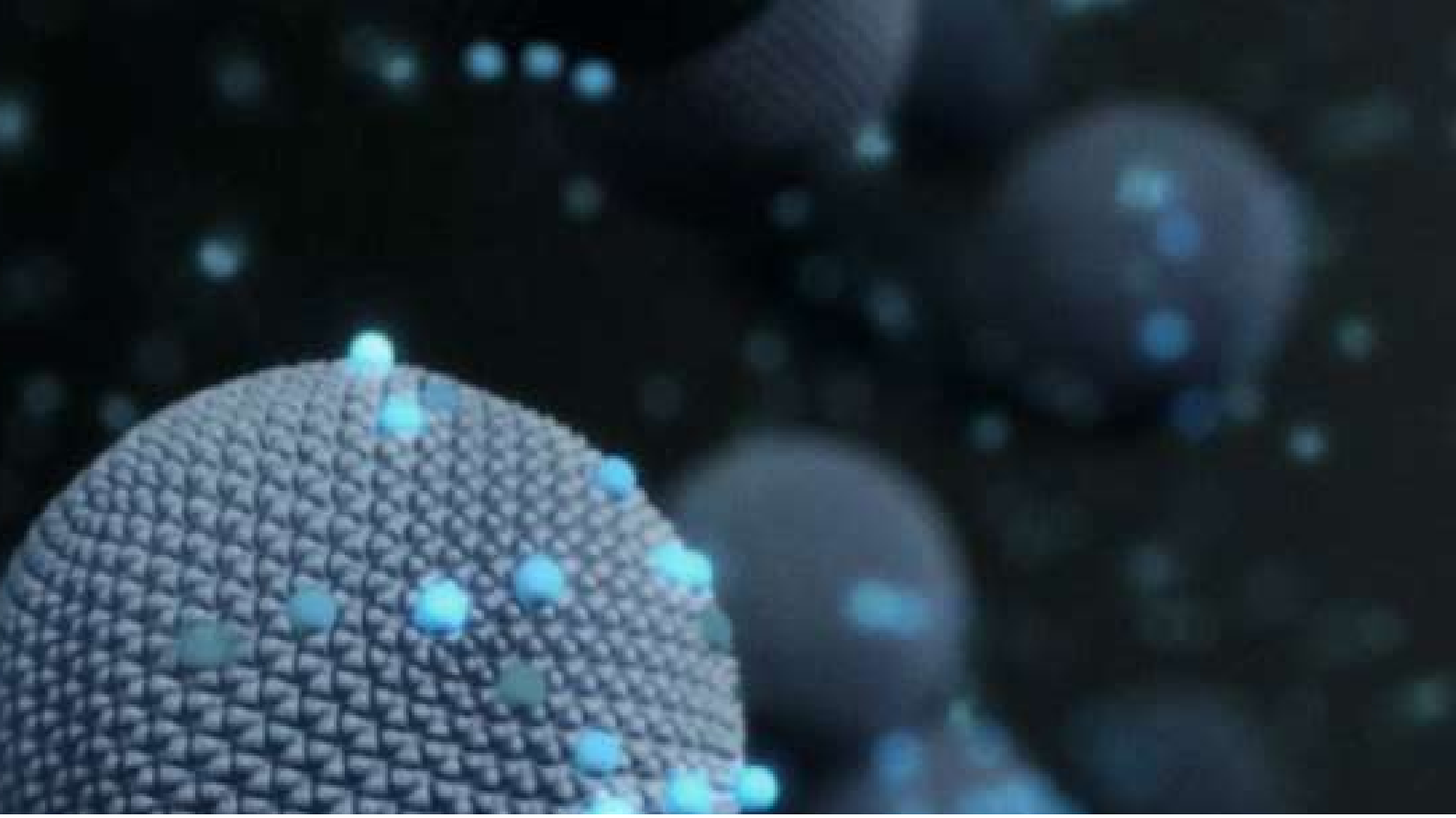

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Posters- Day 02

Poster Presentations

NMS-01
Title: Investigation on the optical thermometry using fluorescence intensity ratio in microcrystals
Aihua Zhou, Nankai university, China

NMS-02
Title: Lanthanide-doped upconversion microcrystals with luminescent properties of multicolor tuning and dual-mode emission for anti-counterfeiting
Dandan Ju, Nankai University, China

NMS-03
Title: Effect of TiO_2 coating method on adsorption of zeolite nanoparticles
Taehwan Oh, Yeungnam University, South Korea

NMS-04
Title: Ag-Pt bimetallic nanoparticles reduction catalysts: Effects of their metal alloying composition and h2 evolution studies
Shalaka Varshney, Ariel University, Israel

NMS-05
Title: Effect of γ-ray MWCNTs on electrical conductivity of a PET/graphite composite
Younggon Son , Kongju National University, Republic of Korea

NMS-06
Title: Astrocytes, a key gateway for ZrO_2: Tb nanoparticles transmission through the blood–brain barrier
Marcin Chodkowski, Warsaw University of Life Sciences, Poland

Investigation on the optical thermometry using fluorescence intensity ratio in microcrystals

Aihua Zhou, Dandan Ju, Feng Song
Nankai university, China

Temperature is an important parameter in our daily life. However, some circumstances aren't suitable for contacting temperature measurement such as volcanic, coal mines and high-voltage power stations. To our delight, the emission intensities of adjacent energy levels can be thermally populated in different temperaturedue to the Boltzmann distribution. Thus, it can precisely show the temperature through detecting the fluorescence intensity ratio. In our previous experiments, the NaGdTiO4 and β-NaLuF4:Yb3+/Er3+microcorystalshave been obtained by the traditional solid-state reaction method and hydrothermal method to study the temperature sensing property, respectively. In NaGdTiO4:Yb3+/Tm3+experiment, the multi-ratios of the upconversion intensities increase linearly with temperature (100K-300K) provides us a simple and accurate temperature measurement method. Multi-ratios can be more accurate than using only one, allowing for self-referenced temperature determination. In addition, the NaLuF4microcorystals are also deeply studied. By introducing the 40% of Ca2+ ions, the upconversion luminescence intensities are obvious enhanced. The excellent upconversion luminescence is more suitable for temperature sensing, owing to the feasibility in the practical applications. The maximum sensitivity of β-NaLuF4:20Yb3+/2Er3+/40Ca2+ (mol%) is0.00040K-1at 120K under the excitation pump power 1W, indicating that the sample with Ca2+ has potential for application to temperature sensing.

Biography

Aihua Zhou is still a doctoral candidate in nankai university. From 2014 to 2016, she works on the surface plasmon polariton enhanced quantum cutting for improvement of the conversion efficiency of the silicon-based solar cell. From 2016 to present, her research concentrates on optical temperature sensing of rare-earth ion dopedphosphors.

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Notes:

Lanthanide-doped upconversion microcrystals with luminescent properties of multicolor tuning and dual-mode emission for anti-counterfeiting

Dandan Ju, Aihua Zhou, FengSong
Nankai University, China

Lanthanide-doped upconversion (UC) materials always attract wide attention due to their special anti-Stokesshifting, which allow emitting visible light under near-infrared (NIR) light excitation. The UC materials can be applied inmany fields, including biomarkers, display, security printing, solar cells, photodynamics therapy (PDT),and temperature sensing. Among all the UC hosts, NaLnF4 (Ln=Y3+, Lu3+, Gd3+) hostsare considered as suitable materials for UC emission. However, the utilization of traditional UC materials is limited by theirlow luminescence efficiency and intractable emission color.

Distorting the symmetry of the crystal environment surrounding Ln3+ is an effective method of increasing UC luminescence intensity, and doping is a potential route to tailor the environment around Ln3+ ions. Simply tuning the co-doping concentration of ions with different valences (Li+ and Lu3+)could notonly modify the morphology and size of NaYF4:Er/Yb microcrystals but also enhance the emission intensity without changingthe phase of the host matrix, and meanwhile, both the excitation power density and pump wavelength are responsible for color-tuning properties of the bulk microcrystalswhich suffer from the insensitive response to excitation power before.The changing colors can be easily distinguished with naked eyes and multicolor emission of NaYF4:Er/Yb/Li/Lu would create an exciting possibility for easily visualizing anti-counterfeit pattern instead of complicated decoding setup.

Besides, we synthesized the uniform core-shell structured NaLnF4@-NaLnF4 microcrystals via the epitaxial growth technique. These microscale core-shellstructures provided a platform for the spatially confining optical process while possessing highluminescence efficiency.The uniform NaYF4@NaLnF4 microrods, with a series of rare-earth ions doped into the core and shell layer at various dopingconcentrations, achieved color-tuning of the upconversionemission and dual-mode emissionat the single-microcrystal level, makingthem ideal candidates in photovoltaic and anti-counterfeiting applications.

Biography

Dandan Ju is a doctoral candidate of the Key Laboratory of Weak Light Nonlinear Photonics at Nankai University, China. Her research interest includes the synthesis, design and application of lanthanide-doped upconversionmicrocrystal, focusing on increasing the upconversionluminescence efficiency and achieving multicolor emission for practical application, such as photovoltaic, security purpose, etc.

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Notes:

Effect of TiO_2 coating method on adsorption of zeolite nanoparticles

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Titanium dioxide (TiO_2) was coated onto zeolite nanoparticles to enhance the heat stability of adsorbed functional materials into zeolite. The effect of synthesizing method and reaction conditions on adsorption and the heat resistance of the materials was investigated. Titanium isoproxide (TTIP) was used as a precursor for TiO_2. Reaction conditions such as reaction time and pH of the precursor solution were varied in this study. TiO_2 coating methods were a separate stepwise reaction and a simultaneous reaction. The coating procedure was more effective than change in the reaction conditions. After absorbing the function material into the zeolite particles, they were melt compounded with poly(ethylene terephthalate) (PET) polymer.

Acknowledgement: *This work was supported by the project of P0002868 and 217C000523.*

Biography

Taehwan Oh has completed his PhD at the age of 28 years from Seoul National and has worked for Taekwang Industry and HUVIS from 1998 to 2008. He is a professor of Yeungnam University. He has published more than 20 papers in reputed journals and serving as an editorial board member of Korean Fiber Society

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Ag-Pt bimetallic nanoparticles reduction catalysts: Effects of their metal alloying composition and h2 evolution studies

Shalaka Varshney[1], Ronen Bar-Ziv[2], Tomer Zidki[1]
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In the advancing field of nanotechnology, metallic nanoparticles (NPs) have gained a tremendous interest as heterogeneous catalysts and been well established as the subject of a wide research due to their promising use in catalysis.1-3 Herein, we present a kinetic study of reduction reactions on Ag, Au, Pt metallic and Ag-Pt bimetallic alloy NPs that were synthesized in aqueous suspensions without using any stabilizer. Owing to the synergistic and alloying effects between the metals in Ag-Pt alloy NPs, those have shown superior catalytic performance in the reduction of 4-nitrophenol to 4-aminophenol by NaBH4. In the bulk, an alloy of Ag and Pt has not been observed because of the vast immiscibility of these metals, whereas in the nanosized regime, the prepared Ag-Pt alloy NPs have not only shown higher catalytic efficiency than their mono-metals but also eliminated the induction time which was observed in the pure Ag NPs case. Kinetics studies of hydrogen evolution on all NPs were conducted in order to follow the reduction mechanism of the fastest Ag-Pt catalyst. High-resolution transmission electron microscopy (HR-TEM) and X-Ray powder diffraction (XRD) studies show that the silver-rich Ag-Pt alloy NPs have a spherical linked shape and confirm the structure of an alloy with the size of ~4.0 nm. Ag-Pt alloy NPs are also relatively low-cost catalysts as their one particular metal ratio composition presented the highest catalytic activity with a relatively low content of Pt.

Biography

Shalaka Varshney was born in Uttar Pradesh, India in 1993. She is a PhD student at the Department of Chemical Sciences, Ariel University, Ariel, Israel under the supervision of Dr.TomerZidki. She received her Dual Degree B.Tech and M.Tech in Nanotechnology from the University of Rajasthan, Jaipur, India in 2016.Her research currently focuses on the investigation of nano-catalytic reaction mechanismon the surface of nanoparticles. Her major interests are in the synthesis and characterization of metallic, bimetallic nanoparticles and different dimensional nanomaterialsand their self-assembly in discotic liquid crystals.

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Notes:

Effect of γ-ray MWCNTs on electrical conductivity of a PET/graphite composite

Younggon Son and TaehyunYoo
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The effects of a compounding method and γ-ray treated multiwall carbon nanotubes (MWCNTs) on the electrical conductivity of graphite/PET composites were investigated. We found that dispersion of MWCNTs in the PET phase plays a critical role in determining the electrical conductivity of graphite/PET/MWCNT composites. Dispersion and electrical conductivity were enhanced by a two-step method in which PET and MWCNTs are compounded in advance and the MWCNT/PET mixture is then compounded again with graphite. It was also observed that γ-ray treated MWCNTs provide enhanced conductivity in the graphite/PET/MWCNT composite. The synergetic effect of the two-step mixing method and γ-ray treatment made it possible to increase the conductivity of graphite/PET composites to a great extent with a very small amount of γ-ray irradiated MWCNTs.

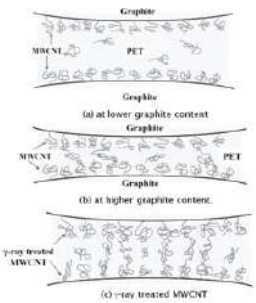

Figure: Schematics of dispersion state of graphite/PET/MWCNT composites.

Biography

Younggon Son has expertise in polymer processing and rheology. His special interests is development of small devices which compounds two different polymers with small quantity and measures the rheological properties with only several tens milligrams.

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Notes:

Astrocytes, a key gateway for ZrO_2: Tb nanoparticles transmission through the blood–brain barrier

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[2]Polish Academy of Sciences, Poland

Nanoparticles (NPs) have been used in various commercial and medical applications. Considered possible applications of NPs in medicine include cancer therapy, cellular imaging and delivery of various molecules into cells. Recently, it was suggested that NPs are able to permeate into the brain tissue and this translocation can happen by passing to the bloodstream and crossing the blood brain barrier (BBB). Our previous findings, for the first time show trafficking of the vesicles containing nanoparticles along the projections of the neurons in the culture of primary murine neurons. Following the lack of sufficient knowledge about the NPs in the nervous system, we aimed to investigate the mechanisms of the uptake, trafficking and toxicology issues of nanoparticles in astrocytes, one of the elements of the BBB.

For the experiment on primary murine astrocytes, non-toxic nanoparticles based on the zirconium oxide doped with 0.5%Tb (ZrO_2:Tb) were used. Balb/c (H-2d) mice were used to establish primary culture ofmurine astrocytes. Concentration of 0.001 mg/ml of ZrO_2:Tb in growth medium was added to the primary murineculture medium, and the interactions with actin cytoskeleton as well as mechanisms of endocytosis were investigated.

Introduction of ZrO_2: Tb NPs into the culture of primary murine astrocytes did not induce toxicity, nor other adverse effects. We did not observed any changes in the structure of actin filaments at 3 and 24 h after administration of NPs. Moreover, co-localization of the nanoparticles and clathrin indicates that probably this pathway participates in endocytosis of NPs in astrocytes. Our findings confirm that the NPs enter the brain tissue by crossing the blood brain barrier. In conclusion, the ZrO_2:Tb nanoparticles proved to be biocompatible and a valid tool to assess intracellular trafficking dynamics in the neurobiology.

Acknowledgments: *The research was partially supported by the National Centre for Research grants "Maestro" 2012/06/A/ST7/00398, "Miniatura" DEC-2017/01/X/NZ3/00205and "Sonata-Bis" UMO 2012/05/E/NZ4/02994 supported by the grant from 05-1/KNOW2/2015 "Healthy Animal-Safe Food".*

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