DAY 1

Keynote Forum

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Liqiu Wang, Nano Res Appl Volume:4
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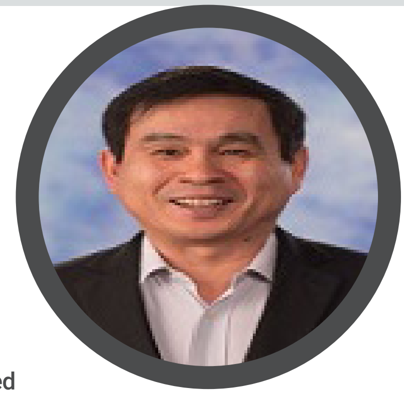
MICROFLUIDICS ENABLED STRUCTURES FOR MANIPULATING LIQUIDS



Liqiu Wang
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HKU-Zhejiang Institute of Research and Innovation (HKU-ZIRI), China

Nature has always been our inspiration source of innovations. Chinese Kung Fu developed effective moves from hunting skills of powerful beasts like snakes, eagles, and tigers; airplanes mimic the skillful flight of birds; legged robots imitate legged animals such as dogs and spiders. Nowadays, state-of-the-art technology enables us to unveil mysteries of the microscopic world and thus invent at microscale with precision. We have been using the precision of microfluidics in manipulating liquids at nano-/subnano-liters and engineering nano-/micro- structures to mimic evolutionarily-optimized nano/microstructures in insects that interact with liquids, and thus developed a series of techniques for manipulating liquids precisely: water collecting, liquids repelling, and droplets manoeuvring. The breakthroughs have yielded three articles in Nature Communications. Unique structural and topological features of spider-silks and their web enable them being a super water collector witnessed by a large number of water droplets handing on them in the early morning. With the microfluidic technology, we have precisely fabricated robust microfibers with spindle cavity-knots and different topological fiber-networks in mimicking these features. These microfibers are endowed with unique surface roughness, mechanical strength, and long-term durability, thus enabling a super performance in collecting water. The maximum water volume collected on a single knot is almost 495 times the knot volume; the water collection is even more efficient and scalable with their networks. These light-weighted yet tough, low-cost microfibers offer promising opportunities for large-scale water collection in water-deficient areas. Liquid-repellent surfaces repel liquids instead of allowing droplets to adhere. These surfaces are important in many fields including self-cleaning clothes and kitchenware, enhanced heat transfer, and anti-fouling, anti-corrosive and drag reduction coatings. The dream of research and development on liquid-repellents is a structure that has robust liquid repellency, strong mechanical stability, and is inexpensive to produce on a commercial scale. However, the functional outcomes of existing liquid-repellent surfaces have not been satisfactory, because of inadequacies of conventional structural design and fabrication approaches in engineering microstructures and properties of such surfaces. We developed a low-cost scalable approach for the fabrication of well-defined porous surfaces with robust liquid repellency and strong mechanical stability. The design of the liquid-repellent surfaces is inspired by structures on springtail cuticles, which can effectively resolve the longstanding conflict between the liquid repellency and the mechanical stability. Springtails are soil-dwelling arthropods whose habitats often experience rain and flooding. As a consequence, springtails have evolved cuticles with strong mechanical durability and robust liquid repellency to resist friction from soil particles and to survive in watery environments. We design the porous surfaces to be composed of interconnected honeycomb-like microcavities with a re-entrant profile: the interconnectivity ensures mechanical stability and the re-entrant structure yields robust liquid repellency. The cuticle-like porous surfaces are fabricated by self-assembly using microfluidic droplets, which takes full advantage of the capabilities of microfluidics in terms of scalability and precise-handling of small fluid volumes. The generation of these cuticle-like porous surfaces using microfluidics has led to precise, controllable, scalable, and inexpensive fabrication. Some semiaquatic insects can readily walk on water and climb up menisci slope due to the dense hair mat and retractable claws of complementary wettability on their tarsi. Inspired by this, we created a mechano-regulated surface whose adhesive force to liquid droplets can be simply switched through mechanical regulation. The mechano-regulated surface functions as a “magic hand” that can capture and release multiple tiny droplets precisely in a loss-free manner, and works for both water and oil droplets down to nano-litre scale. These surfaces are relevant and crucial in various high-precision fields such as medical diagnosis and drug discovery where the precise transferring of tiny liquid is a must. Learning from nature paves the way for creating nano/microstructures with unique features to interact with liquids on-demand. Small yet powerful, these structures can manipulate liquids effectively and precisely. With these techniques, water may be gathered directly from the air in deserts, no more laundry may become true, and liquids can be conveniently handled like solids

Biography

Prof. L. Q. Wang received his PhD from University of Alberta (Canada) and is currently a full professor in the Department of Mechanical Engineering, the University of Hong Kong. He is also the Qianren Scholar (Zhejiang) and serves as the Acting Executive Director for the Zhejiang Institute of Research and Innovation (HKU-ZIRI), the University of Hong Kong and as the Director and the Chief Scientist for the Laboratory for Nanofluids and Thermal Engineering at HKU-ZIRI. Prof. Wang has over 30 years of university experience in thermal & power engineering, energy & environment, transport phenomena, materials, nanotechnology, biotechnology, and applied mathematics in Canada, China/Hong Kong, Singapore and the USA, and 2 years of industrial experience in technology and IP development/management/transfer as the Chief Scientist & the Global CTO.

Prof. Wang has secured over 80 projects funded by diverse funding agencies and industries including the Research Grants Council of Hong Kong, the National Science Foundation of China and the Ministry of Science and Technology of China, totaling > US$ 20m. Prof. Wang has published 10 books/monographs and over 390 book chapters and technical articles including 3 in the Nature Communications, 1 in the PNAS and 12 in the Physical Review Letters, many of which have been widely used by researchers all over the world, and been ranked amongst the top 1% of most-cited scientists (ESI). Prof. Wang has also filed 36 filed patents/SoftwareCopyrights and led an international team in developing a state-of-the-art thermal control system for the Alpha Magnetic Spectrometer (AMS) on the International Space Station. The AMS project is headed by Professor Samuel C. C. Ting (Nobel laureate in Physics, MIT, USA) and is to search for antimatter, dark matter and spectra of cosmic rays.

Prof. Wang has received various awards, including the recent TechConnect Global Innovation Award at the TechConnect World Innovation Conference & Expo (TCWI) 2018 (Anaheim, CA, USA; May 13-16, 2018), the Silver Medal at the 46th International Exhibition of Inventions of Geneva (Palexpo, Geneva, Swiss; April 11-15, 2018), the Innovation Award by the Optical Society (Singapore; July 25-28, 2017), and the First Outstanding Achievement Award of Hangzhou Oversea Scholars (Hangzhou Municipal Government, China; 2016). His research has been widely featured by local, national and international media.

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Seiki A Chiba et al., Nano Res Appl Volume:4
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INNOVATIVE WAVE POWER GENERATOR SYSTEM USING DIELECTRIC ELASTOMER

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The wave power generation has attracted attention as one of useful utilization methods for ocean energy. However, the conventional wave generators are large, expensive and unable to efficiently generate electric power with small amplitude waves limiting their widespread usage. To solve these problems, we would discuss the possibilities for a wave power generator using dielectric elastomer (DE) recently developed as a novel method for harvesting renewable energy. DE is a new smart material technology with characteristics and properties not seen in other materials. The basic element of DEs is a very simple structure comprised of thin polymer films (elastomers) sandwiched by two electrodes made of a stretchable material. DEs can operate as an electrically-powered actuator. When a voltage difference is applied between the electrodes, they are attracted to each other by electrostatic forces leading to a thickness-wise contraction and plane-wise expansion of the elastomer. The use of a DE actuator in the reverse mode, in which deformation of the elastomer by external mechanical work is used to generate electrical energy, has been gaining more attention. As DE is very light, inexpensive, and easily formed into multiple layered structures, it can make a very simple and robust direct drive wave power system that is economically viable. DE has moved now from the research and development stage to the commercial domain with research and development on practical applications and furthermore to the mass production stage

Biography

Seiki A Chiba was Executive Director for advanced R&D project development, Stanford Research Institute (SRI International). He served SRI for 22 years. He was supervising advanced R&D programs including Japanese Government projects. Currently, he is serving as CEO and Professor at Chiba Institute of Science. He has published more than 367 papers in the various areas and has been serving as an Editorial Board Member of AWMC, *Industrial Engineering & Management, Steel Structures and Construction, and Journal of Material Science.* He has received his PhD in Metallurgy and Material Science from the University of Wales (Britain). Part of this research was implemented with the subsidy of New Energy and Industrial Technology Development Organization (NEDO) in Japan.

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Alicia de Andres et al., Nano Res Appl Volume:4
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GRAPHENE BASED PLATFORMS FOR BIOSENSING AND ENHANCED OPTICAL IMAGING

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[2]Rovira I Virgili University, Spain
[3]University of Aveiro, Portugal
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Different approaches to develop graphene based sensors with possible applications for ultra-sensitive detection and quantification of molecules and biomarkers as well as for optical imaging of any 2D or quasi 2D materials are presented. On one hand, we focus on enhancing the analyte Raman signal by optimizing and combining different amplification mechanisms. Raman spectroscopy is a non-destructive easy to use and specific technique but with low sensitivity. Heterostructures of highly reflecting aluminum and adequate dielectric films have been designed and fabricated to maximize the interference enhanced Raman scattering effect (IERS). Graphene is used as an excellent platform for organic and biomolecules deposition. The combined amplification with that related to localized plasmons of metallic nanoparticles (SERS) is demonstrated. In the same direction, a very interesting IERS amplification platform is that provided by adequately designed ordered porous alumina structures. CVD graphene is transferred on top of the pores so that a continuous flat surface allows the deposition of the analyte. These IERS platforms also provide amplification of fluorescence signals and increase significantly the quality of the optical images for sufficiently thin inorganic or organic samples. Another approach is based on the covalent functionalization of graphene by adding carboxyl acid groups which allow successive binding with different biologically active molecules for antigen sensing applications. We present a new approach for in-situ specific surface functionalization of graphene which differ from the commonly used graphene oxide derived materials. With this method, it is possible to obtain highly conductive COOH functionalized either monolayer or few-layer graphene films. The relative concentrations of defects and functional groups are optimized and the electronic transport characteristics (sheet resistance and mobility) are very adequate for sensing. The bio-molecules detection is carried out by fluorescence images

Biography

Alicia de Andrés received her PhD in Physics from the Autonomous University of Madrid. Since 2008, she is Research Professor at the Materials Science Institute in Madrid. She is the Leader of the Graphene based hybrid materials group and head of the Optical Spectroscopies Laboratory. She has authored over 160 WOS publications and leaded and participated in projects funded by national, regional and European agencies as well as industrial companies. Her research has focused on the development and study of materials with applications in spintronics and optoelectronics. At present, her interest is developing in graphene based hybrid materials with optimal synergy of organic semiconductors, inorganic nanoparticles and graphene properties for applications as transparent electrodes and as nanostructured active layers in PVs, LEDs, sensors and SERS imaging, materials for lighting and photovoltaics based on rare earth doped nanoparticles and metal organic frameworks as well as metal-organic perovskites.

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Jan J Dubowski, Nano Res Appl Volume:4
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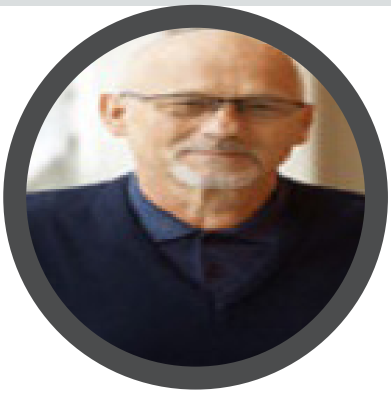
PHOTO ATOMIC LAYER ETCHING: AN INNOVATIVE TOOL FOR NANOSTRUCTURING OF QUANTUM SEMICONDUCTOR MICROSTRUCTURES



Jan J Dubowski
3IT-Université de Sherbrooke, Canada

Etching of semiconducting materials with the atomic level resolution is of a high interest to technologies addressing fabrication of low dimensional devices, tunability of their optoelectronic properties and precise chemical control of device surfaces and interfaces. The so-called digital etching (DE) process that takes advantage of self-limiting reactions was introduced almost 30 years ago for processing of Si devices. This concept has also been explored for etching of GaAs, GaAs/AlGaAs, Ge1xSix compounds, SiO2, SiN and some other materials. Conventional DE consists of a series of two cycles, each involving a limited or self-limited reaction step followed by a step designed to remove reaction products from processed surfaces. Typically, 0.1-1.5 nm of material is etched in each cycle which is calculated based on post-processing measurements. The lack of diagnostics that would allow monitoring this process *in situ* is a significant drawback of conventional DE techniques. We have demonstrated that for photoluminescence (PL) emitting GaAs/AlGaAs nanoheterostructures, it is possible to carry out PL-monitored photocorrosion in cycles analogous to those employed in DE. The advantage of this digital photocorrosion (DIP) process, carried out in liquids that support photocorrosion, but do not react significantly with materials in darkness, is that it could be carried out in cycles with a sub-monolayer resolution and simultaneously monitored with PL. Recently, we have demonstrated that DIP could also be monitored with open circuit potential (OCP) measurements. An excellent agreement between the position of GaAs/AlGaAs interfaces revealed during photocorrosion by PL and OCP suggests that DIP could also be monitored *in situ* for other materials with non-measurable PL. I will discuss fundamental parameters describing this novel diagnostics process, as well as its application for both sensing and nanostructuring of III-V quantum semiconductors. The perspective of congruent decomposition of compound semiconductor nanoheterostructures with *in situ* monitored atomic layer resolution will also be discussed

Biography

Jan J Dubowski received his PhD degree in Semiconductor Physics from the Wroclaw University of Technology, Poland. He is a Canada Research Chair and a full Professor at the Department of Electrical and Computer Engineering of the University de Sherbrooke, Canada. He is a Fellow of SPIE- The International Society for Optics and Photonics (citation: "For innovative methods of investigation of laser- matter interaction"). He has published over 200 research papers, reviews, book chapters and conference proceedings. He is an Associate Editor of the Journal of Laser Micro/Nanoengineering, Biosensors and Light: Science & Applications.

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DAY 2

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Yongmei Zheng, Nano Res Appl Volume:4
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BIOINSPIRED WETTABILITY SURFACES: DEVELOPMENT IN MICRO- AND NANOSTRUCTURES

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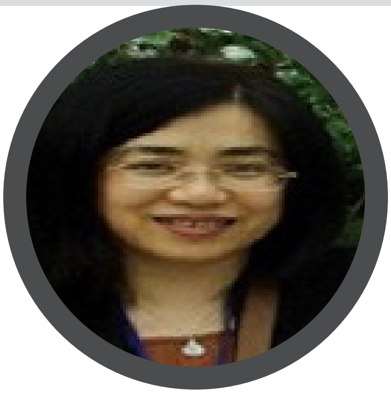

Biological surfaces create the enigmatical reality to be contributed to learning of human beings. They run cooperate between of endlessly arranged various-style gradient micro- and nanostructures (MN) that greatly provide with excellent functions via natural evolvement. Such biological surfaces with 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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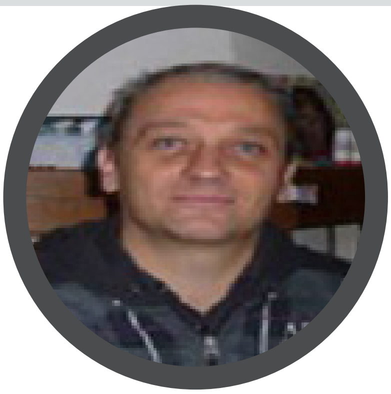
NANOMATERIALS FOR TRANSPARENT ELECTRODES: PROPERTIES, CHALLENGES AND PROSPECTS



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

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[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
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THYMOQUINONE-BASED NANOFORMULATIONS FOR CANCER TREATMENT

Hala Gali-Muhtasib
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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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DAY 3

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WIND TUNNEL TEST OF DIELECTRIC ELASTOMER ACTUATOR FOR MARS AIRPLANE

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[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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SOFT TWO DIMENSIONAL NANOMATERIALS AT BIOINTERFACES

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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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