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# WORLD NANOTECHNOLOGY CONFERENCE

APRIL 19-20, 2021 | VIRTUAL EVENT

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WORLD NANO 2021

BOOK OF ABSTRACTS

# WORLD NANOTECHNOLOGY CONFERENCE

APRIL 19-20, 2021 | VIRTUAL EVENT

**Theme:**

Presenting excellency of Nanotechnology to transform the World

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# *About* MAGNUS GROUP

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# *About* World Nano 2021

**Magnus Group** is pleased to invite you to participate in the VIRTUAL EVENT - '**World Nanotechnology Conference**" (World Nano 2021)' during **April 19-20, 2021**.

This World Nano 2021 is the International platform which brings together the collection of investigators who are at the forefront in the field of Nanotechnology. The scientific program will include oral presentations of sub-disciplines, keynote sessions led by eminent scientists and poster sessions presented interactively by junior scientists and graduate students. It is the ultimate meeting place for all the experts worldwide for new interdisciplinary scientific collaborations and networking.

With its scientific sessions, you are provided assurance to explore the latest technologies and breakthroughs that are specific to your area of work. No doubt the event has a broad scope of topics and continued in parallel sessions relative to the specific area of research.

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# KEYNOTE FORUM | DAY 1

# WORLD NANOTECHNOLOGY CONFERENCE

April 19-20, 2021

**Marcos Lanzon***

Department of Architecture and Building Technology, Universidad Politecnica de Cartagena (UPCT), Spain

## Nanomaterials: New trends for preserving architectural heritage materials

Nanomaterials are widely used in biological, medical and engineering applications, but little is known on their use to preserve heritage materials. Architectural materials undergo irreversible deterioration due to chemical, physical and biological processes that occur on a wide variety of substrates, such as stone, lime, plasters or bricks among other materials. The preservation of monuments and heritage materials brings important socio-economic advantages to modern societies and hence, adequate protective measures are necessary to extend their durability. However, the conservation of architectural materials is a challenging goal since building materials are chemically heterogeneous, and they are often exposed to variable conditions in real situations. In this regard, coatings made with nanoparticles (NPs) are original solutions to consolidate, protect and delay deterioration of heritage materials. Indeed, NPs may penetrate through porous substrates, fill external pores and strengthen poorly cemented grains at the surface, thus preventing detachment and peeling events. In addition, minor colour change and coating-substrate similarity are also important requirements of protective treatments (compatibility). In this way, Ca(OH)2 or $SiO_2$ NPs have been proposed to preserve building materials since they are usually rich in carbonates and/or silicon-based minerals like quartz (i.e. chemically similar). This paper analyses the pros and cons of coatings based on NPs as well as new insights aimed at their functionalisation and other chemical strategies. Finally, the performance of NPs coatings is shown for real heritage samples taken from La Alhambra (XIII century), medieval bricks (XII-XIII centuries) and Roman constructions dated at 1-5 B.C.

**Biography:**

Prof. Marcos Lanzon was completed his PhD in Chemistry at the Organic Chemistry Department, University of Murcia, Spain. He joined the Technical University of Cartagena (UPCT) in 2009, where he teaches building materials with a major focus on materials science, coatings and characterisation. He has co-authored numerous scientific papers in journals and international conferences. He is member of the editorial board of Cement and Concrete Research and Materiales de Construcción and has collaborated extensively with the EU Commission in scientific actions within 7FP and H2020. He has also conducted research collaborations with several institutions for the conservation of heritage constructions, some of which are declared as World Heritage Sites by UNESCO.

**R.C. Jagessar***

Department of Chemistry, Faculty of Natural Sciences, University of Guyana, South America

## Carbon nanotubes and its application in Nanotechnology

Carbon nanotubes often refer to single-wall carbon nanotubes (SWCNTs) with diameters in the range of a nanometer. Single-wall carbon nanotubes are one of the allotropes of carbon, intermediate between fullerene cages and flat graphene. Carbon nanotubes also often refer to multi-wall carbon nanotubes (MWCNTs), consisting of nested single-wall carbon nanotubes, weakly bound together by van der Waals interactions in a tree ring-like structure. If not identical, these tubes are very similar to long straight and parallel carbon layers, cylindrically arranged around a hollow tube. Multi-wall carbon nanotubes are also sometimes used to refer to double and triple wall carbon nanotubes. Carbon nanotubes can also refer to tubes with an undetermined carbon wall structure and diameters less than 100 nanometers. While nanotubes of other compositions exist, most research has been focused on the carbon ones. The length of a carbon nanotube produced by common production methods is typically much larger than its diameter. Thus, for many purposes, end effects are neglected and the length of carbon nanotubes is assumed infinite. Carbon nanotubes can exhibit remarkable unique properties. These include electrical conductivity, while others are semiconductors. They also have exceptional tensile strength and thermal conductivity, because of their nanostructure and strength of the bonds between carbon atoms. In addition, they can be chemically modified. Thus, due to their variable, unique properties, carbon nanotubes have found applications in many realms such as electronics, optics, composite materials nanotechnology, and other applications of materials science. In addition, carbon nanotubes can be integrated into other molecules to form novel structures with unique properties, different from the individual reactants. These unique products have also found application in many realms of nanotechnology.

**Biography:**

Raymond C. Jagessar obtained his BSc (Distinction) in Chemistry/Biology from the University of Guyana (1992) and his PhD from the UK (1995). He held three Post Doctoral Research Fellowships at the University of South Carolina (USA), Wichita State University (USA) and the University of the West Indies (1996-1999). He has also won several international awards, amongst them are Chartered Chemist, CChem and Fellow of the Royal Society of Chemistry, FRSC, UK. His research interests are broad, covering the spectrum of Pure and Applied Chemistry, Chemical Biology, Pharmaceutical and Medicinal Chemistry. He has published over seventy (70) research articles, five book chapters and presented at several international conferences. He is currently Professor in Chemistry at the University of Guyana (South America).

**Soshu Kirihara***

Joining and Welding Research Institute, Osaka University, Osaka, Japan

## Nanoparticles joining in smart additive manufacturing, design & evaluation

Complicated metal and ceramic components were fabricated by smart additive manufacturing, design and evaluation (Smart MADE). The functional structures were designed by computer graphics and fabricated by stereolithography of 3D printing. Metal and ceramic particles of 3 - 5 μm and 200 - 600 nm in average diameters were dispersed into photosensitive acrylic resin at 50 - 60 % in volume percent. vol. %. The formed paste materials were spread on a substrate by using a mechanical knife edge. An ultraviolet laser beam of 355 nm in wavelength was focused into 50 μm in diameter and scanned to draw cross sectional solid patterns of 50 μm in layer thickness. The laser irradiation power and scanning speed were set at 300 mW and 3000 mm/s, respectively. A composite precursors were obtained successfully thorough continuous laminations. The metal or ceramic components could be created by dewaxing and sintering in the vacuum or air atmosphere, respectively. In this investigation, sound absorption structure with connected spherical cavities of Helmholtz chambers were developed by the Smart MADE. The frequency spectra and sound pressure distributions were plotted and visualized by computational fluid dynamics and acoustic simulation. The high frequency noises generated from high speed gas flames using in thermal spraying and cutting will be controlled and reduced effectively by utilizing the fabricated Helmholtz sonic modulators.

**Biography:**

Soshu Kirihara is a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation "Materials Tectonics", geometric structures were successfully fabricated to modulate energy and materials flows effectively. Original stereolithography systems were developed, and new start-up company "SK-Fine" was established through academic-industrial collaboration.

**Pingan Zhu and Liqiu Wang***

Department of Mechanical Engineering, the University of Hong Kong, Hong Kong

## No more laundry?

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. With this technique, no more laundry may become true.

**Biography:**

Prof. L. Q. Wang received his PhD from University of Alberta, Canada, and is currently a professor in the Department of Mechanical Engineering, the University of Hong Kong (HKU). Prof. Wang has over 20 years of university experience in transport phenomena, materials, nanotechnology, biotechnology, energy & environment, thermal & power engineering, and mathematics, and 2 years of industry experience as the Chief Scientist & the Global CTO. In addition to 6 authored scholarly monographs/books, 4 edited scholarly monographs, 8 book chapters, 76 keynote lectures at nternational conferences and over 120 invited lectures in universities/industries/organizations, Prof. Wang has published 420+ papers, many of which have been widely used by researchers all over the world, and been ranked amongst the top 1% of most-cited scientists according to Clarivate Analytics' Essential Science Indicator. Prof. Wang has also filed 30+ patents/software copyrights, and developed, with an international team consisting of about 100 scientists and engineers, a state-of-the-art thermal control system for the Alpha Magnetic Spectrometer (AMS) on the International Space Station (ISS). Prof. Wang's work has been widely featured by local, national and international media, and received recognition through a number of awards, including the 2018 TechConnect Global Innovation Award, the 2018 Silver Medal of the International Exhibition of Inventions of Geneva, and the 2017 OSA Innovation Award.

**Doina Elena Gavrila***

University "Politehnica" Bucharest, Romania

## Electrical behaviour of composite materials with polymer matrix / metal powders

The interest for polymer / metal filler composite materials results from the fact that their electrical properties are close to those of metals and the mechanical characteristics and processing methods are close to those of plastics. In such composites there is the possibility of controlling the electrical and physical characteristics which determines a wide variety of their applications. The composites obtained may have a range of excellent properties, high electrical and thermal conductivity, high specific strength and modulus, high temperature resistance, corrosion resistance etc. The article studies the electrical characteristics of composite materials with polypropylene and polyethylene matrix with Fe and Al metal powders. A comparative study of the electrical characteristics for different quantities of metal powders (3, 5, 8%) is made in connection with the dimensions of the metallic particles, the mechanical and thermal characteristics and the morphological changes of the composites. It was proved the existence of the agglomeration of particles from powders prior the preparation of the composite samples. For this reason in the article average values of their dimensions were used. The agglomerations of the particles are persistent and do not decompose in totality during extrusion and injection processing, their number increasing with increasing content of metal powders. Electrical behaviour at different frequencies was investigated at temperatures close to room temperature by Dielectric Spectroscopy. The dependence of losses on the nature of polymers, metal powders, dimensions and the amount of particles was shown. Important data were obtained for materials in which the metal powders have nano dimensions. The results obtained were correlated with changes in mechanical and thermal characteristics. Morphological analyzes of metal powders and composites were determined by DSC and SEM analyzes. Different variations of the crystallinity are observed for the two polymers. Particles with nano dimensions penetrate more easily both in the amorphous domains and in crystalline domains.

**Biography:**

Doina Elena Gavrila, Romanian physicist, researcher. Member Professional Commission Universities of Bucharest, 1985-1989. Member New York Academy of Sciences, Romanian Physics Society. She holds Bachelor of Science with honors, Aurel Vlaicu College, Bucharest, 1959. Master of Science in Physics, University Bucharest, 1965. Doctor of Philosophy, University Bucharest, 1975.

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SPEAKERS | DAY 1

# WORLD NANOTECHNOLOGY CONFERENCE

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**Sadia Afrin Khan*[1], Monique E Johnson[2], Antonio R Montoro Bustos[2], Karen E Murphy[2], Ingo H Strenge[2] and Timothy R Croley[1]**

[1]Center for Food Safety and Applied Nutrition (CFSAN), U.S. Food and Drug Administration, 5001 Campus Drive, College Park, MD

[2]Chemical Science Division, Material Measurement Laboratory, National Institute of Standards and Technology, Gaithersburg, MD

## Characterization of nanoparticles in silicon dioxide food additives

Food additives are added to food for their technical effect in food (e.g., emulsifier, stabilizer, thickener, anticaking agent, antioxidant, etc.). Food grade additives may have a particle size distribution that extends into the nanoscale range. Silicon dioxide, in its amorphous form, is an approved food additive (21 CFR 172.480) for use as an anticaking agent. During production, there is a possibility of the occurrence of nanosized silicon dioxide particles, however, there are limited data concerning the particle size distributions of food-grade silicon dioxide. Therefore, we conducted multi analytical techniques to characterize the particle size distribution of six commercially available silicon dioxide food additives. In this work, dynamic light scattering was used to measure particle size distribution, electron microscopy for imaging and single-particle inductively coupled mass spectrometry (sp-ICP-MS) to measure the concentration of nano-sized materials present in silicon dioxide additives. These results allow the USFDA to gain a greater understanding of the nano-sized particle occurrence in commercial food-grade silicon dioxide intended for use as food additives.

**Biography:**

Dr. Sadia Khan is a research scientist in the Center for Food Safety and Applied Nutrition (CFSAN) at the US Food and Drug Administration. Dr. Khan received her Ph.D. degree in Chemistry from Jackson State University in 2013. Her research interest includes analysis of nanomaterial, nanomaterial-based assay for toxin detection as well as characterization of nanoparticle in food additives. She has over twenty publications in high impact journals and cited no less than 1850 times.

**Mengyao Lyu and Donglu Shi***

Department Mechanical and Materials Engineering, College of Engineering and Applied Science, University of Cincinnati, Cincinnati, Ohio

## Desalination via photothermal thin films

There has been an increasing need to utilize abundant seawater, via desalination, for a variety of uses, in particular agriculture in the arid regions that are highly vulnerable to the effects of climate change. Current desalination technologies provide effective solutions to the increasing water demands but require substantial electric energy, therefore limiting their sustainable use where conventional power infrastructure may not be available. We have applied photothermal (PT) thin films on various substrates for effective desalination using both Fe3O4 and Chlorophyll. Nanoparticles of PT materials are dispersed in thin film coatings for effective evaporation by exposing saltwater in substantially large areas under natural solar light. Upon solar irradiation, the PT thin films will harvest solar light largely in UV and NIR bands and convert it to heat and effectively increasing the temperature of the film leading to high evaporation rate of the seawater. The temperature increase, depending on the photothermal effect of the PT materials, can reach 50-60 $^0$C for effective water evaporation. We report preliminary experimental results on nanoparticle synthesis, thin film deposition, photohermal effect measurement, and evaporation and condensation of a benchtop apparatus. We show that the PT thin films will be most effective in desalination via harvesting solar light, energy free.

**Biography:**

Prof. Donglu Shi is currently the Chair and Graduate Director of the Materials Science and Engineering program at College of Engineering and Applied Science, University of Cincinnati. Donglu Shi's research focuses on nanoscience that deals with structural design not only for fundamental studies of new bio-chemical-physical properties but also unique functionalities for energy and medical applications Donglu Shi has so far published 290 refereed SCI journal publications including Advanced Materials, Nature, Physical Review Letters, and ACS Nano. He is currently the Editor-in-Chief of Nano LIFE, and Associate Editor of Materials Science & Engineering: C, and J. of Nanomaterials.

**Robert J Buenker* and Fachbereich C**

Mathematik und Naturwissenschaften, Bergische Universität Wuppertal, Gaussstr. 20, D-42097 Wuppertal, Germany

## Inertial clocks and remote non-simultaneity

A review of the predictions of Einstein's Special Theory of Relativity (STR) shows that two of them, remote non-simultaneity and time dilation, are incompatible with each other. It is claimed thereby that two numbers, time differences for the same event that are measured by observers in different states of motion, always occur with a fixed ratio, but that one of them can be zero (simultaneous observation) without the other being so as well. It is impossible that both of these conditions can each be met in any given case, and this constitutes proof that the Lorentz transformation (LT), from which both effects are derived in STR, is not a physically valid set of space-time equations. It is further pointed out that a clock moving through space in the complete absence of unbalanced external forces, in accordance with Newton's Law of Inertia and the Law of Causality, must be expected to have a constant rate. As a consequence, elapsed times $\Delta t$ and $\Delta t'$ measured by two such (inertial) clocks for the same event should always occur in a fixed ratio, as expressed by the following relation: $\Delta t'=\Delta t/Q$, where Q is a constant fully determined by the above ratio. It is shown that experiments with x-ray frequencies and circumnavigating atomic clocks are perfectly consistent with the above relation, accordingly referred to as the Universal Time-dilation Law (UTDL). Finally, it is demonstrated that there is another set of space-time equations that satisfies both of Einstein's postulates relativity and is also consistent with the above proportionality between elapsed times, one which, unlike the LT, is devoid of any internal contradictions. This transformation clearly rules out the possibility of remote non-simultaneity, and is consistent with the view of classical physicists that space and time are completely separate entities.

**Biography:**

Prof. Buenker received his Ph. D in Chemistry from Princeton University in 1966. He became Asst. Prof. of Chemistry at the University of Nebraska-Lincoln in 1967 and was promoted to Full Professor in 1973. He received the Senior U.S. Scientist Award of the Humboldt Foundation for research and teaching at the University of Bonn, Germany in 1973-75 and a Marie Curie Individual Fellowship of the European Community at the National Hellenic Research Foundation, Athens, Greece in 2003-2004. He became Professor Chemistry at the University of Bonn in 1976 and University of Wuppertal in 1977 until his retirement in 2007. He has over 600 peer-reviewed publications in chemistry and physics

**Maria Alejandra Usuga Higuita[1, 2], Nicolas Crespo-Monteiro[1], Francis Vocanson[1], Michel Langlet[2]*, Damien Jamon[1], Arnaud Valour[1], Hugo Bruhier[1], Marion Hochedel[1] and Yves Jourlin[1]***

[1]Université de Lyon, UJM Saint Etienne, CNRS, Laboratoire Hubert Curien UMR 5516, Saint Etienne, France.
[2]Université de Grenoble Alpes, CNRS, Laboratoire des Matériaux et du Génie Physique (LMGP), UMR 5628, Grenoble, France.

## Fabrication of a resonant waveguide grating (RWG) with a single-step $tio_2$ sol-gel technological approach on planar and non-conventional substrate (tube)

Resonant waveguide gratings (RWG), also called Guided-Mode Resonance (GMR) gratings, have been discovered several decades ago, and are known for their possibility to very strongly reflect an incident wave for special configurations of the parameters of the optical setup like wavelength, polarization and incident angle. An RWG consists of a high index waveguide and a periodic corrugation (grating) to couple the waveguide mode.

A simple technological approach combining a photo-patternable sol-gel layer and UV lithography is demonstrated for the fabrication of Resonant Waveguide Gratings (RWG) on planar and cylindrical substrates. The aim is the demonstration of a resonant reflection in TE and TM polarization in the near infrared region (NIR) in a planar and a cylindrical-based resonant waveguide gratings (RWG). In this presentation, we want to show a planar corrugated waveguide structure excited by a planar wave, and demonstrate this concept to a circularly symmetrical waveguide applied to the inside wall of a 8 mm diameter tube, excited by a cylindrical wave. For both configurations, same $TiO_2$ sol-gel layer is used for the high index waveguide layer and for the grating printing thanks to the UV photosensitivity property of the sol-gel layer, avoiding any etching processes. The reflection spectrum was measured in the near-infrared range and compared to the modeling using the Chandezon method, showing the expected resonant behavior.

**Biography:**

Maria Usuga studied Materials engineering at the University of Antioquia, Colombia. The last year she did a double degree of physics and chemistry of high performance materials at Université de Limoges, she graduated as engineer and master in 2018. In the same year she started her PhD in the laboratoire Hubert Curien on materials for optics and photonics.

**Mario Khoury***
Institut Matériaux Microélectronique Nanosciences de Provence, France

## Fabrication of Si-based dielectric resonators: Combining etaloning with Mie resonances

We use low-resolution optical lithography and plasma etching joined with solid state dewetting of crystalline, ultra-thin silicon on insulator (c-UT-SOI) to form monocrystalline, atomically-smooth, silicon-based Mie resonators in well controlled large periodic arrays.

The dewetted islands have a typical size in the 100 nm range, about one order of magnitude smaller than the etching resolution. Exploiting a 2µm thick $SiO_2$ layer separating the islands and the underlying bulk, silicon wafer, we combine the resonant modes of the antennas with the etalon effect. This approach sets the resonance spectral position, improves the structural colorization and the contrast between scattering maxima and minima of individual resonant antennas.

Our results demonstrate that templated dewetting enables to form defect-free, faceted islands that are much smaller than the nominal etching resolution and that an appropriate engineering of the substrate improves their scattering properties. These results are relevant to applications in spectral filtering, structural color and beam steering with all-dielectric photonic devices.

**Chandra Mohan[1]*, Sarla Kumari[2] and Sulekh Chandra[3]**

[1]School of Basic & Applied Sciences, K. R. Mangalam University, Gurgaon, Haryana, India

[2]Department of Chemistry, S. D. Government College, Beawar, Rajasthan, India

[3]Department of chemistry, Zakir Husain College (University of Delhi), New Delhi, India

## Synthesis and characterization of semicarbazide based U(VI) complexes and their application in electrochemical sensors

Diverse research have been reported for designing a sensor by caring open chain and macrocyclic compounds operating system through transition metal, which display a rich and versatile redox activity. Chemical sensors are devices, which can deliver realtime and online information on the presence of specific compounds or ions in complex samples. These sensors are useful in analysis of food products, drinking water, beverages, fertilizers, soil industrial effluents etc. These sensors based on electroactive materials and provide a rapid and convenient means for quantitative estimation of anions and cations in biological and industrial samples.The aim of present work is to synthesize Schiff based metal complexes of U (VI) ion. Schiff based metal complexes of semicarbazide with transition metals have received much attention because of their significant electrochemical activity in Ion selective electrodes. U (VI) metal complexes of Schiff base can be employed as ionophore to develop chemical sensors for their application as sensors and in potentiometric titrations as indicator electrode.

**Biography:**

Dr. Chandra Mohan obtained his Ph.D. degree in the field of Inorganic Chemistry from Guru Gobind Singh Indraprastha University, Delhi, India. He has done M.Phil. in Inorganic Chemistry from Delhi University in 2009. He has keen interest in research and development activities. He has 7 years of teaching experience and about 8 years of research experience. He has published 12 research papers in reputed journals and has presented 10 research papers in various conferences and workshops held in India and abroad. He is an awardee of a national fellowship from University Grant Commission Delhi for his Ph.D. degree. He was also invited as keynote speaker from Sensor Lab, University of the Western Cape, Bellville, South Africa in May 2015 and in the International conference at Imperial College London, UK in September 2018. Presently he is a reviewer & editorial member of 8 International Journals and 8 scientific bodies in India and abroad. He was the Co-convener of the International Conference (AASET-2017), organized at K. R. Mangalam University, Gurugram in 2017. He is also a member of The Institute of Innovation, Invention & Entrepreneurship (TIIE) team, established at K. R. Mangalam University.

**Soumendra Darbar*[1, 2], Srimoyee Saha[3] and Atiskumar Chattopadhyay[1]**

[1]Faculty of Science, Jadavpur University, Raja S C Mallick Road, Kolkata, India
[2]Department of Chemistry, Jadavpur University, Raja S C Mallick Road, Kolkata, India
[3]Department of Physics, Jadavpur University, Raja S C Mallick Road, Kolkata, India

# Unprecedented redox scavenging signature along with antioxidant action of silver nanoparticle coupled with Andrographispaniculata (AP-Ag NP) against carbon tetrachloride ($CCl_4$) induced toxicity in mice

Nanotechnology possesses several branches including nanomedicine, which is the most promising field in the future medicine and is a probable therapeutic agent in prevention and medication of life threatening diseases through ROS inhibition. Therapeutic potential and antioxidant activity of Silver Nanoparticle coupled with Andrographis paniculata (AP-Ag NP) was assessed against CCl4 induced oxidative stress at tissue level. The main aim and objective of the study is to find out the comparative efficacy of AP-AgNP against carbon tetrachloride (CCl4) induced oxidative stress model. Carbon tetrachloride (CCl4) was administered upon Swiss albino mice (male) for 28 days concurrently with AP-AgNP (50 mg/kg body weight) orally to evaluate the therapeutic effects on hepatic oxidative injury, antioxidant potential and heme synthesis pathway. Serum ROS level was significantly elevated and blood and liver superoxide dismutase (SOD), catalase (CAT) activity and GSH level also significantly decreased after exposure of carbon tetrachloride (CCl4). Treatment with AP-AgNP, as nano-antioxidant significantly increased SOD, CAT activity and GSH levels which indicate the recovery of oxidative injury and indicates restoring inhibited aminolevulinate dehydratase (ALAD) activity. In conclusion our results suggest that Silver Nanoparticle synthesized using Andrographis paniculata (AP-Ag NP) have the potential antioxidant effect in experimental animals.

**Ezequiel R Coscueta*[1], Celso A. Reis[2, 3 and 4] and Manuela Pintado[1]**

[1]Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho, Porto, Portugal

[2]i3S - Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Porto, Portugal
[3]Institute of Molecular Pathology and Immunology of University of Porto, Ipatimup, Porto, Portugal
[4]Medical Faculty, University of Porto, Al. Prof. Hernâni Monteiro, Porto, Portugal

## Chitosan-olive oil microparticles for phenylethyl isothiocyanate delivery

Phenylethyl isothiocyanate (PEITC) is released from the enzymatic hydrolysis of gluconasturtiin, the most abundant glucosinolate found in watercress (a vegetable from the family Brassicaceae) by the enzyme myrosinase. Among all the isothiocyanates, PEITC is one of the most extensively studied with various biological activities such as antimicrobial, antioxidant and anti-inflammatory. Several studies suggested that PEITC exhibits cancer preventive and therapeutic effects on multiple types of cancers and is one of the isothiocyanates that is being tested in clinical trials. PEITC is highly reactive due to its considerably electrophilic nature. Furthermore, it is hydrophobic and has low stability, bioavailability and bioaccessibility, restricting its use in biomedical and nutraceutical or food applications. Thus, the encapsulation of this agent has the function of overcoming these limitations, promoting its solubility in water, and stabilizing it, preserving its bioactivity. So, polymeric microparticles were developed using chitosan-olive oil-PEITC systems. For this, an optimisation process (factors: olive oil: chitosan ratio and PEITC: chitosan ratio) were implemented through a 3-level (32) factorial experimental design. The responses were: the particle size, zeta-potential, polydisperse index, and entrapment efficiency. The optimal formulation was further characterized by FTIR and biocompatibility in Caco-2 cells. Optimal conditions were olive oil: chitosan and PEITC: chitosan ratios of 1.46 and 0.25, respectively. These microparticles had a size of 629 nm, a zeta-potential of 32.3 mV, a polydispersity index of 0.329, and an entrapment efficiency of 98.49%. We found that the inclusion process affected the optical behaviour of the PEITC, as well as the microparticles themselves and their interaction with the medium. Furthermore, the microparticles did not show cytotoxicity within the therapeutic values of PEITC. Thus, PEITC was microencapsulated with characteristics suitable for potential biomedical, nutraceutical and food applications.

**Biography:**

Dr. Ezequiel R. Coscueta is a Researcher at the Centre for Biotechnology and Fine Chemistry and an Invited Assistant Professor at Universidade Católica Portuguesa. He graduated in Biotechnology at Universidad Nacional del Litoral (2013) and obtained his PhD in Biological Sciences from the Universidad Nacional de Rosario (2018), both from Argentina. He co/authored 12 articles published in international specialized journals and 2 book chapters. His main background is in biotechnology for agri-food by-products valorisation. Additionally, his recent work led him to venture into nanotechnology with a focus on biomedical applications for the gastrointestinal tract, which captured his total interest.

**Khavkin Aleksander**

Oil & gas and underground hydromechanics Department, Gubkin University, Russia

## The role of nanotechnologies in hydrocarbon energy

Nanotechnologies the approach means purposeful regulation of properties of objects on molecular and above molecular a level (0,1-100 nanometers), determining fundamental parameters of physical objects. It takes place in sciences about the Earth in sphere oil and gas recovery. Prospects for the development of hydrocarbon energy depend on the cost of oil and gas production, the cost of oil and gas chemistry, cost of hydrocarbon transportation. The applications of nanotechnology in the extraction, processing and transport of hydrocarbons are considered. Nanotechnology operations for enhanced oil recovery (NTOEOR) include operations (methods, techniques) governed by nanoscale phenomena, or which employ nanoscale particles. Examples of the use of nanotechnology in the oil and gas industry are given. Foam systems stabilized by nanoparticles have proven highly effective in reducing the water cut in oil and gas production wells: has achieving 15-20 percent reductions in water cuts and 1,5-1,7 times oil production growth, as well as providing 500-10,000 tons of extra crude per treated well. At the gas field technological effect was additional 16 million m3 per single mining well. Adding nano-dispersive modifiers to cement can enhance the strength of concrete and foam concrete 2.5-3 times. Economic calculations have shown that the use of nanotechnology in the production of gas will reduce the cost of their production by more than 20%, which will significantly affect the development of hydrocarbon energy. Indeed, the advantages of green energy point to the cost of energy and its eco-friendliness. Recent events in the world under cold weather conditions have shown both the need to conserve hydrocarbon energy and the need to improve green energy technologies. Therefore, the development of hydrocarbon energy and its share in the global energy system will depend on the economic efficiency of hydrocarbon energy.

**Biography:**

Dr. A. Khavkin studied in Gubkin University of oil and gas (1970-1975). General Technologist in All-Russian Scientific and Research Institute of Oil & Gas (1991-2001), Head of the laboratory in the Institute for Problems of Oil&Gas RAS (2001-2012), Deputy Director General of the Institute of Geology and Fossil Development (2012-2014). He has participated of conferences in Australia, Brazil, China, Denmark, Egypt, England, Hungary, Japan, France, Norway, Spain, Russia, UAE, published more than 600 research articles. Honorary Oilman of Russia. Laureate of the UNESCO Medal «Contribution to Nanoscience and Nanotechnology» (2010). Member of the Central Board of the Nanotechnology Society of Russia.

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# KEYNOTE FORUM | DAY 2

# WORLD NANOTECHNOLOGY CONFERENCE

April 19-20, 2021

**Meera Ramrakhiani***

Department of Post Graduate Studies and Research in Physics and Electronics, Rani Durgavati University, India

## Nanostructures as sustainable energy materials in PEC solar cells

Soaring petroleum price and global warming have fueled the intensive research for alternative energy sources and technologies. The reserve of fossil fuel is depleting very fast. The search for alternative source of energy has led to rapid strides in the utilization of solar energy. Sun is an inexhaustible/long term source of energy and may be considered as potential energy source for future.

Photovoltaic provide clean energy that can reduce world's dependency on petroleum. Silicon based solar cells have achieved power conversion efficiency of around 24%; however, the high efficiency is offset by high cost. Much effort has recently been directed towards developing new and better solar energy conversion devices. Photoelctrochemical (PEC) solar cell is one of the promising alternatives as it possesses advantages such as low cost and simple processes. In photoelectrochemical cell the junction formation is quite easy and polycrystalline films also work very well. In a single band gap solar cell, efficiency is low since a narrow range of photon energies of solar spectrum can be utilized. Use of more than one layer of semiconductors of different band gaps as photoelectrode in solar cell utilizes larger portion of solar spectrum improving its performance.

Nanomaterials are among the new promising energy harvester for solar cells. These structures and materials improved efficiency and exhibit enhanced selectivity. Different sizes and shapes (e.g., spheres, tubes rods, wires, hexagonal and pyramids) of nanomaterials structures are being used for development of solar energy converters. Nanoparticles, nanorods and nanowires have been used to improve the charge collection efficiency in solar cells, to demonstrate carrier multiplication and to enable low temperature processing of photovoltaic devices. New nanocrystalline and porous materials hold the key to fundamental advances in energy production, which is one of the great challenges in the future. In recent years, various forms of nanostructures have been created including nanoflacks, nanorods, nanotubes, flower-like structures, branched nanowires and core-shell structures for solar energy conversion. The use of nanostructures has potential to provide high conversion efficiency since large area is available to absorb photons, photo-generated carriers have to travel over a short distance and the effective band gap can be tuned to absorb a particular photon energy-range. The effective band gap can be varied by changing the size and/or structure in case of nanomaterials.

Multi-layered photoelectrode with different effective band gaps can be prepared by depositing various sized nanostructured layers of same material and enhanced photovoltaic effect can be achieved. The film consisting of nanoparticles has an interconnected/porous structure. The thin film consisting of one-dimensional nanostructures can easily transport the photoelectrons by providing the direct conduction paths for electrons from the point of generation to the collecting electrode, also maintaining a high surface area for harvesting larger amount of solar radiations. For these reasons, semiconductor nano-architectures have been increasingly studied for their potential solar energy applications. Presently multi-layered photolectrochemical solar cells using various nanostructures have been discussed.

**Biography:**

Dr. Meera Ramrakhiani has been the Professor and Head, Department of Physics and Electronics and also Dean, Faculty of Science at Rani Durgavati University Jabalpur, India. She has done her graduation, M.Sc. and Ph.D. from the University of Jabalpur (now Rani Durgavati University) and has 40 years of teaching and research experience. More than 30 students have completed their Ph.D. degree under her supervision in the field of nanomaterials, luminescence and photovoltaic solar cells. Dr. Meera Ramrakhiani has authored or coauthored about 400 research papers/book chapters/articles. She has received many awards and is life member of many professional bodies.

**Thomas J Webster***

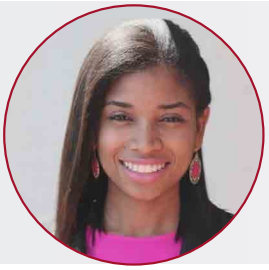
Art Zafiropoulo Chair, Department Chair, Chemical Engineering, Northeastern University, USA

## Hello implantable nanosensors: Goodbye old-fashion hospitals

There is an acute shortage of organs due to disease, trauma, congenital defects, and most importantly, age related maladies. While tissue engineering (and nanotechnology) has made great strides towards improving tissue growth, infection control has been largely forgotten. Critically, as a consequence, the Centers for Disease Control have predicted more deaths from antibiotic-resistant bacteria than all cancers combined by 2050. Moreover, there has been a lack of translation to real commercial products. This talk will summarize how nanotechnology with FDA approval can be used to increase tissue growth and decrease implant infection without using antibiotics. Studies will also be highlighted using nano sensors (while getting regulatory approval). Our group has shown that nanofeatures, nano-modifications, nanoparticles, and most importantly, nanosensors can reduce bacterial growth without using antibiotics. This talk will summarize techniques and efforts to create nanosensors for a wide range of medical and tissue engineering applications, particularly those that have received FDA approval and are currently being implanted in humans.

**Biography:**

Thomas J. Webster's (H index: 88) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995) and in biomedical engineering from Rensselaer Polytechnic Institute (M.S., 1997; Ph.D., 2000). Prof. Webster has graduated/supervised over 189 visiting faculty, clinical fellows, post-doctoral students, and thesis completing B.S., M.S., and Ph.D. students. He is the founding editor-in-chief of the International Journal of Nanomedicine (pioneering the open-access format). Prof. Webster currently directs or co-directs several centers in the area of biomaterials: The Center for Natural and Tropical Biomaterials (Medellin, Colombia), The Center for Pico and Nanomedicine (Wenzhou China), and The International Materials Research Center (Soochow, China). He regularly appears on NBC, CNN, MSNBC, ABC News, National Geographic, Discovery Channel, and BBC News talking about science and medicine. He has received numerous honors and is current a fellow of AANM, AIMBE, BMES, NAI, IJN, FSBE, and RSM.



**Germercy Paredes*[1, 2], Etienne Palleau[3], Mathieu Delmas[1], Grégory Seine[1], Fabrice Piazza[2] and Marc Monthioux[1]**

[1]Centre d'Elaboration des Matériaux et d'Etudes Structurales (CEMES), UPR-8011 CNRS, Université de Toulouse, France

[2]Laboratorio Nanociencias, Pontificia Universidad Católica Madre y Maestra, Santiago de Los Caballeros, Dominican Republic

[3]Laboratoire de Physico-Chimie des Nano-Objets (LPCNO), UMR-5215 CNRS, INSA, Université de Toulouse

## Carbon-nanotube-supported pyrolytic carbon micro/nano-cones

Pyrolytic carbon (PyC) is extensively used in industrial processes as composite matrices or coatings. It is obtained by thermally decomposing a gaseous carbon precursor (typically methane, but other hydrocarbons are used as well) and then allowing the carbon moieties produced to deposit either within a preform (chemical vapor infiltration - CVI) or onto a surface (chemical vapor deposition - CVD). When nanosized objects such as single carbon nanotubes are used as substrates for the deposition of PyC generated by time-of-flight CVD (a CVD process in which the time given to the carbon moieties to recombine is a key parameter, along with others such as temperature, time of dwell, gas feedstock composition), a variety of nanosized, complex morphologies can form. Among them, carbon cones with nanosized apex can be obtained. Aside the cones, micrometer-sized carbon beads or fibre segments are deposited meanwhile which are a key morphological component for allowing handling and mounting the carbon cones and then using them for various applications. Based on both the literature dealing with pyrolytic carbon deposition processes and experimental observations, a specific deposition mechanism is proposed, involving (1) the creation of carbon species as radicals resulting from the thermal cracking, and (2) the transient formation of pitch-like liquid phase (i.e., containing polyaromatic hydrocarbons – PAHs) droplets resulting from the more or less extensive recombination of the products from the cracking. Both radicals and droplets compete to deposit onto the individual carbon nanotubes. The former are mostly responsible for the growth of the cones, while the latter are mostly responsible for the growth of the carbon beads or fiber segments. In this picture, it is believed that a key parameter for the combined formation of the cone + bead/fiber segment to occur is the ratio between the droplet and the nanotube diameters, respectively. A full investigation of the structure, inner texture, et nanotexture by high resolution transmission electron microscopy is reported, which allows interesting mechanical and conducting properties to be predicted. Correspondingly, applications of the carbon nanocones as electron emitters for cold-field electron sources on the one hand, and as probes for various modes of near-field microscopy on the other hand, have been tested.

**Biography:**

Prof. G. Paredes graduated as industrial engineering at the PUCMM, Santiago, Dominican Republic in 2009. She started teaching and working on carbon materials and then went to France for 2 years (INSA-Toulouse, INP-Grenoble) where she graduated in technological innovation in 2014. She obtained the position of a Professor at the PUCMM in 2015. She joined the research group of M. Monthioux at CEMES, Toulouse, France, for 3-4 years. Her recent publications report works on carbon nanocones (Puech et al., J. Carbon Res. 5 (2019) 69) and diamanoïds (Piazza et al., Carbon 145 (2019) 10).

**G Pellicane[1*, 3], FM Gaitho[1], GT Mola[1] and M Tsige[2]**

[1]University of Kwazulu-Natal School of Chemistry and Physics, King Edward Avenue, Scottsville Pietermaritzburg 3209 South Africa

[2]University of Akron Department of Polymer Science, Goodyear Polymer Center 1021 Akron Ohio 44325-3909 U.S.A

[3]Universita' degli studi di Messina, BIOMORF, Azienda Ospedaliera Universitaria Policlinico "G. Martino" 98125 Messina, Italy

## Nano-structuring of polymer blends at the interface driven by topology

Physical techniques for surface modification of plastics use surface-active agents, which can self-assemble at the surface. Many techniques, which are important in modern technologies, use polymer blends, and there is considerable interest to understand the extent the composition of the surface layer differs from that in the bulk for molten polymer mixtures. Dynamical and structural properties of polymers in the melt state are strongly influenced by molecular architecture and blending polymers with different molecular topologies could be potentially exploited to control interfacial segregation of the polymer film, and to achieve optimal mechanical properties of the plastic material. However, a deep understanding of the role of chain architecture and molecular mass in determining which species preferentially adsorb at a given interface is lacking. Experiments to resolve the matter are typically conducted by mixing polymers possessing the same repeat chemistry, but different molecular architecture. Here we show the results obtained in large-scale molecular dynamics simulations of linear-cyclic polymer films, and we find clear evidence of enhancement of linear polymers at the interface, in agreement with recent experimental results. The behaviour predicted by the self-consistent field theory (SCF), i.e., enhancement of cyclic polymers at the interface, emerges for relatively long chains. In our presentation, we provide a picture of the microscopic mechanisms through which the chain length arbitrates the competition between the different packing constraints imposed by the loop and linear geometry of the two polymers. We also discuss the role of enthalpic and entropic factors of the interfacial free energy of the system in determining which species in the blend preferentially adsorbs at the interface.

**Biography:**

Dr Pellicane is an Associate Professor in the School of Chemistry and Physics, at the University of Kwazulu-Natal (South Africa), where he works since 2011. He took his PhD in Physics at the University of Messina (Italy) in 2001. He is the author of more than 60 peer-reviewed articles indexed in the web of Science – core collection database. His field of expertise is the theory and computer simulation of simple/complex fluids. He has acted as a reviewer for several international journals operating in the field of chemical physics, physical chemistry, theoretical condensed matter physics, polymer science.

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SPEAKERS | DAY 2

# WORLD NANOTECHNOLOGY CONFERENCE

April 19-20, 2021

**Huiyao Wang***
New Mexico State University, USA

## Enhanced visible light photocatalysis by BN-$TiO_2$ nanocomposites for pharmaceutical degradation and wastewater treatment

Boron nitride (BN) nanosheets are promising support materials for catalysts. A series of BN-$TiO_2$ enabled electrospun nanofibers were synthesized for photocatalytic treatment of ibuprofen and secondary wastewater effluent under visible light. X-ray photoelectron spectroscopy confirmed the existence of B-O-Ti bonds between BN nanosheets and $TiO_2$ nanofibers, resulting in energy rearrangement, narrowed band gap, and enhanced light utilization efficiency of $TiO_2$-BN nanocomposites in the visible light spectrum. Transient photocurrent measurement revealed that the BN enhanced the transport of photogenerated holes from the bulk $TiO_2$ nanofibers to its surface, resulting in more efficient separation and less recombination of the charge carriers. Kinetic study of ibuprofen degradation indicated enhanced photocatalytic performance of $TiO_2$-BN catalysts with higher BN content in the nanocomposites. The kinetic rate constant of $TiO_2$-10% BN catalysts was 10 times higher than the pure $TiO_2$ nanofibers. The degradation of organic contaminants in wastewater followed the same trend as ibuprofen and improved with increasing BN content. The stability of the $TiO_2$-BN nanocomposites as an effective solar photocatalyst was demonstrated by multiple cycles of wastewater treatment. The results proved the $TiO_2$-BN is an appealing photocatalyst under visible light.

**Biography:**

He is an Associate Professor, New Mexico State University, USA. His Areas of Expertise: Advanced research on innovative energy and novel materials for solar energy, fuel cells, hydrogen storage, sensors, electronic devices, and water cleaning. Dynamics and electronic and thermal transport in thin films, nanomaterials, materials, membranes, photocatalysts for manufacturing energy devices and environmental applications. Energy-water nexus by developing solar energy materials and processes to enhance surface-thermal-fluid interactions, and photons to electrons or heat conversion for solar driven water purification and desalination systems. Materials characterization using advanced analytical tools such as transmission electron microscopy (TEM), scanning electron microscopy (SEM), energy dispersive x-ray spectroscopy (EDS), atomic force microscopy (AFM), x-ray diffraction (XRD), x-ray photoelectron spectroscopy (XPS), and laser scanning confocal microscope (LSCM).

**Arnaud Valour*, Maria A. Usuga Higuita, Nicolas Crespo-Monteiro, Stéphanie Reynaud, Marion Hochedel, Damien Jamon, Christophe Donnet and Yves Jourlin**

Université de Lyon, Laboratoire Hubert Curien, UMR CNRS 5516, 42000 Saint-Étienne, France

## Synthesis of micro-nanostructured TiN thin film from a $TiO_2$ Sol–Gel

The miniaturization of optical components to control and manipulate light amplitude, phase, and polarization requires micro- to nanostructured metasurfaces that provide resonant light–matter interactions to exploit optical properties in the visible and near-infrared (NIR) range (plasmonic resonances, wavelength filtering…). Such metasurfaces sometimes need to be implemented under hard-use conditions, including high temperatures and strong field confinement. Transition-metal nitrides, like titanium nitride (TiN), are ideal materials to achieve such properties, but TiN's hardness and chemical inertness make patterning difficult. Here, we demonstrate an innovative direct fabrication process to easily synthesize micro–nanostructured TiN thin film. This new technique consists of combining a direct ultraviolet (UV) –photolithography process with rapid thermal nitridation from a photo-patternable $TiO_2$ sol–gel coating using a low-cost, reproducible process that is compatible with large substrate areas and different shapes. The nanoarchitecture and chemical composition of $TiO_2$ and TiN films were investigated by ultraviolet (UV)–visible–infrared (IR) spectroscopy and Raman spectroscopy, grazing incidence X-ray diffraction (GIXRD), and high-resolution transmission electron microscopy (HRTEM) coupled with electron energy loss spectroscopy (EELS). We obtained micro–nanotextured crystallized TiN surfaces in a significantly shorter time than with conventional nitridation processes. Due to the sol–gel approach, this work also significantly extends the chances of obtaining TiN-based metasurfaces on various substrates (glasses, plastics, etc.) in complex shapes (non-planar-based surfaces), for demanding photonic applications in the future.

**Biography:**

Dr. Valour studied Inorganic Chemistry at the Lyon university, France and graduated as MS in 2013. He then joined the research group of Dr. Tessier at the Rennes Institute of Chemical Sciences UMR CNRS 6226 (ISCR), France and received his PhD degree in 2014. After 18 months as an engineer in the research group of Prof. Jourlin at Hubert Curien Laboratory UMR CNRS 5516, France he started a postdoctoral position under the supervision of Prof. Donnet in the same institution.

**Lamya Al Farsi* and Tewfik Souier**

Department of Physics, College of Science, Sultan Qaboos Univeristy, Muscat, Sultanate of Oman

## How to achieve vertically aligned AZO nanorods array by chemical bath deposition

Zinc oxide as an II-VI compound semiconductor has attracted considerable attention due to its applications in short wavelength optoelectronics devices owing to its wide direct band gap and large exciton binding energy at room temperature. ZnO probably has the richest family of nanostructures among materials. In particular, large surface area 1D nanostructures such as nanorods, nanowires and nanotubes have attracted wide applications in solar cells, photocatalysis, UV diodes and sensors. Nowadays, efforts have been made to improve the optical/electrical properties of ZnO through several methods including extrinsic doping with various elements. Among those, group III atoms such as Al and Ga are capable of reaching very high n-type conductivity without deterioration in optical transmittance. Unfortunately, doping may result in deterioration of the alignment of ZnO nanorods. In this project, a novel sol-gel technique "microwave-assisted hydrothermal method" was employed to grow ZnO nanorods at low deposition temperature of 90° C. The technique was optimized to achieve highly packed and vertically aligned ZnO nanorods array. The optimization includes several parameters such as the growing environment, precursors' solution concentration and pH. In particular, the pH was found to be a crucial parameter to not only optimized but also tuning the shape of the ZnO nanostructures as evidenced by XRD, and SEM. Al-doped ZnO nanorods have been grown successfully by adding the Aluminum nitrates to the precursor solution. In the presentation, I will talk about how we can achieve highly doped and vertically aligned AZO nanorods array. Furthermore, the effect of doping on the structural and optoelectronic properties of nanorods will be discussed.

**Biography:**

I am currently a physics Ph.D. student at Sultan Qaboos University. I graduated from college of Education in 2000 with the Bachelor of Science. I worked as a physics high school teacher from 2000 to 20013. Then, I obtained my master's degree in physics from Sultan Qaboos University in 2017.

**Seongwoo Woo***
Addis Ababa Science & Technology University, Ethiopia

## Reliability design of mechanical systems subjected to repetitive stresses

The basic reliability concepts - parametric ALT plan, failure mechanism and design, acceleration factor, and sample size equation were used in the development of a parametric accelerated life testing method to assess the reliability quantitative test specifications (RQ) of mechanical systems subjected to repetitive stresses. To calculate the acceleration factor of the mechanical system, a generalized life-stress failure model with a new effort concept was derived and recommended. The new sample size equation with the acceleration factor also enabled the parametric ALT to quickly evaluate the expected lifetime. This new parametric ALT should help an engineer uncover the design parameters affecting reliability during the design process of the mechanical system. Consequently, it should help companies improve product reliability and avoid recalls due to the product failures in the field. As the improper design parameters in the design phase are experimentally identified by this new reliability design method, the mechanical system should improve in reliability as measured by the increase in lifetime, LB, and the reduction in failure rate, λ

**Biography:**

Dr Woo has a BS and MS in Mechanical Engineering, and he has obtained PhD in Mechanical Engineering from Texas A&M. He major in energy system such as HVAC and its heat transfer, optimal design and control of refrigerator, reliability design of thermal components, and failure Analysis of thermal components in marketplace using the Non-destructive such as SEM & XRAY. In 1992.03–1997 he worked in Agency for Defense Development, Chinhae, South Korea, where he has researcher in charge of Development of Naval weapon System. He was working as a Senior Reliability Engineer in Refrigerator Division, Digital Appliance, SAMSUNG Electronics.

**Fábio Figueiras***

Department of Physics and Astronomy, Instituto de Nanociência e Nanotecnologia, Portugal

## Thriving narrow band gap ferroelectric oxides for photovoltaic applications

The formation of a ferroelectric Bi2ZnTiO6 (BZT) perovskite-like phase in the thin film form is demonstrated to be viable onto Pt/Si-based substrates at 550 ºC using the rf-sputtering method. This "lead-free" BZT polycrystalline phase has a noncentrosymmetric P4mm tetragonal structure, exhibiting a noteworthy piezoelectric response and an optical gap of 1.48 eV in agreement with the theoretical calculations. Further research and development of BZT thin films can be regarded as a thriving material for innovative generation of optoelectronic and photovoltaic devices where the intrinsic polarization field can replace the function of p-n junctions in semiconductors.

**Biography:**

PhD Researcher in Physics, Nanotechnology, Science and Engineering of Advanced Multifunctional Materials at IFIMUP, Portugal. Expertise in multiferroic oxides, thin film deposition, Nano powders synthesis, electric and magnetic characterization, atomic force microscopy, high resolution X-ray diffraction and Raman spectroscopy.

**J Alam[1]*, MG Nematov[1], NA Yudanov[1] and LV Panina[1,2]**

[1]National University of Science and Technology, MISiS , Moscow 119991, Russia
[2]Immanuel Kant Baltic Federal University, Kaliningrad 236041, Russia

## High - frequency MI in ferromagnetic microwires for magnetic sensor

The design of an advance strip cells on PCB board for VNA calibration which allows to measure the MI dependence at frequency up to GHz region has been discussed in this work. Different types of Co-based amorphous glass-coated microwires were investigated showing large MI changes even at GHz frequencies before and after ac-current annealing. It is found that the microwire at low frequency (less than 300 MHz) had the different behaviour in MI than the high frequency (above 300 MHz) which can be useful for the application of tensile stress to control the magnetic anisotropy even at GHz frequencies. Also, the effect of stress on MI at high frequencies in ac-current treatment of amorphous wire has the potential for developing stress sensitive applications especially for wireless operation at microwave frequencies.

**Weam Sidahmed Awadalla Sidahmed***
University of Khartoum, Khartoum, Sudan

## Characterization of the titanium dioxide nanoparticles

This research aims to study an effect of annealing nanosize titanium dioxide ($TiO_2$), Titanium dioxide ($TiO_2$) is a wide gap oxide semiconductor is an n-type due to oxygen deficiency. It has three phases of the crystal structures including anatase, brookite, and rutile, where the band gap is 3.2 eV for brookite, 3.2 eV for anatase, and 3.0 eV for rutile. The most stable form and the principal source of ($TiO_2$) are rutile. The metastable anatase and brookite will transform to the thermodynamically stable rutile upon calcination at temperatures exceeding 600 °C.

In all three forms, titanium ($TiO_4$) atoms are coordinated to six oxygen ($O_2$) atoms, forming ($TiO_6$) octahedra.

Utilize six grams of ($TiO_2$) material beige color was tope down divided for two parts one was annealed to 600oC for 4 hours and another let without annealing.

The as-prepared samples were further characterized using devices studying ($TiO_2$) properties, X-Ray Diffraction (XRD), Fourier Transformation Infrared Red (FTIR) and USB Spectrometer.

As 0.25g from both samples was taken and put in (FTIR) to reading transmission and absorption properties, 0.5g was taken for two samples put in (XRD), and 0.25g from both samples was taken and used UV-Visible Spectroscopy (USB) to take the readings.

After the properties of the annealed sample were studied and compared to the raw (control powder), this properties were found that the color of the Titanium Dioxide has changed from beige into white as the last one showed fewer impurities and formed Ti-O-Ti vibrational mood which was absent in the control sample.

The band gap was recorded and found to be 2.567 eV and 2.568 eV for control and annealed samples respectively.

**Biography:**

PhD Researcher in Physics, Nanotechnology, Science and Engineering of Advanced Multifunctional Materials at IFIMUP, Portugal. Expertise in multiferroic oxides, thin film deposition, Nano powders synthesis, electric and magnetic characterization, atomic force microscopy, high resolution X-ray diffraction and Raman spectroscopy.

**Moguloori Sai Sowmya and Abbaraju Krishna Sailaja***

Department of pharmaceutics, RBVRR Women's College of Pharmacy, Affiliated to Osmania University, India, Hyderabad

## Preparation of invasomes -A novel carrier for drug delivery

**Background:** Diclofenac sodium is capable of providing benefit to patients suffering from: rheumatoid arthritis, osteoarthritis, and gout. Diclofenac sodium is a medicine that reduces inflammation and pain. It is also used to treat aches and pains, as well as problems with joints, muscles, and bones. The aim of the present work is to prepare diclofenac sodium invasomes by thin film hydration technique.

**Methodology:** In the present study, for the preparation of diclofenac sodium loaded invasomes by thin film hydration technique. The obtained formulations were studied for characterization and evaluation parameters.

**Results:** Among all three formulationsF1 formulation prepared by using 1:1 ratio of drug and lipid at 400 rpm was showing promising results with drug content as 52.51% and drug release of 72.48% were able to sustain the drug release for 12 hours.

**Conclusions:** In this study diclofenac sodium invasomes were prepared by thin film hydration method by using soya lecithin as lipid and using span 60 as surfactant. This study was performed to determine parameters such as drug content and drug release. F1 formulation was considered as the best formulation as it shown best and promising results.

**Biography:**

Dr. A. Krishna Sailaja is currently working as Associate Professor and Head of the Department in RBVRR Women's college of pharmacy, Osmania University, Hyderabad. She has published 130 research papers in various National and International journals. She delivered more than 25 talks on novel drug delivery systems. Published 5 books and filed 4 patents.

**S Ginil Mon[1]*, Y Jaya Vinse Ruban[2], D Vetha Roy[3]**

[1]Department of Chemistry & Research, Nesamony Memorial Christian College, Marthandam, Tamil Nadu, India

[2]Department of Chemistry & Research, St. Xavier's College (Autonomous), Palayamkottai, Tirunelveli, Tamil Nadu, India

[3]Polymer Nanocomposite Centre, Department of Chemistry & Research, Scott Christian College (Autonomous), Nagercoil, Tamil Nadu, India

## A comparative study of solvent blended EDPM / neoprene clay nanocomposites showing progressive thermal and mechanical properties

Nanocomposites have definite advantages over conventional composites due to their light weight, low cost and excellent mechanical, thermal, optical and electrical properties. Clays and layered silicates are well suited for this purpose as they provide polymer-clay nanocomposites (PCNs) and polymer-layered silicate nanocomposites (PLSNs). Elastomers and rubbers are very promising polymeric matrices for the preparation of PCNs because of their multi-characteristic applications. Non-polar EPDM demands polar inducement in the form of compatibilizing agents for getting a homogeneous blend with neoprene.

EPDM/neoprene matrices are prepared by solvent blending without any compatibilizing agents. Morphological studies and single Tg values have established an excellent compatibility of the blend, further confirmed by their enhanced mechanical characteristics. Organo-modified MMT Clay (CA-MMT) and locally available Kaolinite have been filled in the EPDM/ Neoprene matrices to prepare their respective nanocomposites. The CA-MMT is adjudged as the most efficient filler as shown by the comparative studies, even though kaolinite too has shown comparable characteristics in a few cases. It is suggested that kaolinite could be a promising filler to be modified further to attain still better results.

**Biography:**

Ginil Mon (37 yrs.) a chemist who has specialized in Polymer Chemistry got his doctorate for his thesis "Thermal And Mechanical Characteristics of Novel Peroxide-Cured Ethylene Propylene Diene Terpolymer-Neoprene Composite Films with Clay/Graphite Fillers" from the Manonmaniam Sundaranar University. His paper presented in Indraprastha International Conclave on Nano Science and Technology, New Delhi during November 16-17, 2010 was adjudged the best. He has ten publications to his credit with total impact factor 19.749, 83 citations, h-index 4 and i10-index 4. An Environmentalist and International Resource Person in diverse topics including Environment and ICT, he is working in Nanotechnology, Polymer Nanocomposites, Spectroscopy and Molecular Docking. A fellow of Indian Science Congress, member of editorial board for journals, he is also reviewer in five international journals which includes Elsevier journals too. Being an organizing committee member of many international conferences notably in Sanyo, China and Singapore, he has been an invited speaker in eight national and five international conferences including one at Singapore. An excellent Chemistry Professor having enormous experience in teaching all levels of chemistry and well versed in providing courses in Moodle portal, Currently he is teaching in the Post Graduate Department of Chemistry and Research, Nesamony Memorial Christian College, Marthandam near Cape Commorin.

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POSTERS DAY 2

# WORLD NANOTECHNOLOGY CONFERENCE

April 19-20, 2021

**Thaís L A Montanheiro*[1], Beatriz R C de Menezes[1], Larissa S Montagna[2], Renata G Ribas[1], Vanessa M Schatkoski[1], Ana Paula Lemes[2], Gilmar P Thim[1]**

[1]Plasmas and Processes Laboratory, Aeronautics Institute of Technology, São José dos Campos, São Paulo, Brazil

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## GABA-functionalized carbon nanotubes to improve compatibility, dispersion and mechanical properties of PHBV nanocomposites

Poly (3-hydroxybutyrate-co-3-hydroxyvalerate), PHBV, is a biodegradable and biocompatible polyester with the potential to be used as a substitute for conventional thermoplastics. However, PHBV is brittle and has low mechanical properties, which hinder its use for applications that require superior properties. One alternative is the incorporation of nanoparticles into matrices to improve their characteristics. One of the most used nanoparticles is carbon nanotube (CNT), which has remarkable mechanical and electrical properties. The addition of nanoparticles into polymer matrices changes its characteristics, including mechanical and thermal. In this work, CNTs were covalently functionalized with gamma-aminobutyric acid (CNT-GB). The functionalization was confirmed by infrared spectroscopy and X-ray photoelectron spectroscopy. Nanocomposites with 0.5 wt% of CNT and CNT-GB were prepared and evaluated by impact strength, scanning electron microscopy of the fracture surface, Shore D hardness and the crystallization kinetics was studied. The impact strength was reduced by about 12% after the introduction of CNT into PHBV; however, when CNT-GB was added, the impact strength was not harmed. Meanwhile, the impact fracture surface, which presented fragile morphology for PHBV and PHBV/CNT, became ductile for PHBV/CNT-GB, suggesting a strong interaction between CNT-GB and PHBV, and improved dispersion. The improved dispersion could be confirmed by Shore D hardness and by the crystallization activation energy ($E_a$) value. Shore D hardness was increased by about 4% for PHBV/CNT-GB nanocomposite, compared to PHBV. The non-isothermal crystallization kinetics was analyzed using the isoconversional method. The kinetics study showed negative activation energy for all samples, indicating that the crystallization increases as the temperature decreases. The addition of CNT, functionalized or not, reduced the value of $E_a$ when comparing with pure PHBV. The hypothesis is that CNTs act as heterogeneous nucleating agents, accelerating the crystallization process. CNT-GB presented the better dispersion into the PHBV matrix, resulting in the lower value of $E_a$.

**Biography:**

Dr. Thaís Larissa do Amaral Montanheiro graduated in Chemical Engineering at the University of São Paulo, had her master and PhD degrees in Materials Science and Engineering at the Federal University of São Paulo. She is a postdoc at Aeronautics Institute of Technology since 2018, under supervision of Professor Gilmar P. Thim, at the Plasmas and Processes Laboratory. She has published more than 30 research articles

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## Influence of electrospinning methods on characteristics of nanofibres essential for biological applications

Nanofibres may be generated using a number of techniques; however, electrospinning allows industrial-scale production. In this study, we examine different nanofibre properties resulting from five different electrospinning methods when using the same polymer solution (polyurethane and polyvinylbutyral) and environmental parameters within the given range (temperature, humidity, etc.). Specifically, for biological applications (scaffolds, biomass carriers) of nanofibrous structures, it is necessary to know their properties to estimate the behavior of bacteria (biofilm) on their surface respectively in the surface structure. The basic parameters for the determination of bacteria behavior on the surface of nanofibres are a surface charge, porosity, surface morphology, which is strongly related to cell adhesion and other specific physical mechanical properties.

In this paper, we examine the effects of five different electrospinning methods on a range of nanofibre material properties while keeping solution and environmental parameters constant for all methods. Nanofibre characterization (surface integrity) is presently considered one of the most interesting areas of nanofibre research; hence, we undertook a detailed analysis of the nanofibres using modern analysis methods, with the aim of assessing the basic structural properties that affect the nanofibre product's mechanical or physical properties (consequently important for biological interactions). The five electrospinning methods examined were based on (a) alternating current (AC Electrospinning) and (b) direct current (DC Rod Electrospinning, DC NanospiderTM Electrospinning, DC Needle Electrospinning and DC Centrifugal Electrospinning). Detailed analysis of nanofibre structural properties (total fibre length and diameter, pore size and porosity, linearity/curvature rating) was performed using scanning electron microscopy, with thermal properties assessed using differential scanning calorimetry, biodegradability using a respirometer and surface roughness using confocal microscopy.

The results showed clear structural differences in the nanomaterials produced depending on the method used and open further possibilities for research in this area. Based on the results we can claim that DC methods are suitable for the preparation of well defined, compact nanofibre structures (depending on method productivity). Centrifugal electrospinning, on the other hand, may be more suitable for a narrow range of specialist applications, especially as regards medical use, e.g. tissue engineering or sensors, while the more productive AC method may be more suitable for applications requiring substrates with nanofibre coatings that are more thread-like, require thicker layers or rough surfaces. By tailoring the methods and equipment used, therefore, it should be possible to prepare customized nanofibre structures (larger/smaller pore size, specific fibre diameters, etc.) for specific biological applications.

**Biography:**

Karel Havlicek finished his master's degree at the Technical University of Liberec, Czech Republic in 2017 and since the same year, he is a PhD student at the Technical University of Liberec. Karel is now working in the field of biotechnology and hydrobiology. The greatest attention he devotes to the exploration of composite biomass carriers and wastewater treatment processes.

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## Development of conductive nanomaterials for biotechnology applications

Conductive nanomaterials have gained immense interest because of their distinctive properties and their potential in various fields. The wide range of preparation factors influencing the ability of nanomaterials to conduct an electric current, such as material, method and modification, makes their preparation an interesting and challenging task. Conductive nanomaterials can be applied as an electrode in hybrid systems of biotechnology and electrochemistry, bioelectrochemical systems (BES). The BES is a novel approach for removing a wide range of environmental pollutants. It is based on the ability of microorganisms to transfer electrons extracellularly which leads to the conversion of chemical energy to the electrical energy and vice versa.

Within this work, different approaches for conductive nanostructure preparation were employed. The electrostatic spinning (NanospiderTM) was selected as a method for nanofiber preparation. To overcome the poor spinnability of conducting polymers, polyvinyl butyral (PVB), polyamide (PA), polyethene oxide (PEO) and polycaprolactone (PCL) were used as basic nanofiber materials, either to aid the spinnability of conducting polymers or as a support material for subsequent modification. Polyvinylpyrrolidone (PVP), polyaniline (PANI), Fe3O4 nanoparticles and aluminium were selected as conducting components which were loaded into nanostructures by pre-electrospinning blending, polymerization on nanofibers or plasma coating technique. To enhance the mechanical stability of prepared nanostructures, chemical modification by sulfuric acid was carried out in one case.

Prepared nanomaterials were characterized by scanning electron microscopy (SEM), resistance measurements and biological testing. Resistance measurements have shown that only some materials are sufficiently conductive and thus suitable for biotechnology applications. These suitable materials were further tested as biocathodes in BES reactors inoculated with denitrifying bacteria at the lab scale. The performance of reactors with tested nanostructured electrodes was monitored by chronoamperometry, cyclic voltammetry and liquid chromatography.

In total, nine various nanomaterials containing conducting components were prepared. The ability to conduct an electric current was found out in only three of them. A gradual decrease of nitrate concentration was observed in two BES reactors, in which PVB nanofibers with PANI or PVP were used as biocathodes. The potential application of these conductive nanomaterials is for biological removal of nitrate in BES reactors in a wastewater treatment plant.

**Biography:**

Magda Nechanicka finished her master's degree in Nanotechnology at the Technical University of Liberec (TUL), Czech Republic in 2017. She then joined the Department of nanomaterials in natural sciences at the Institute for Nanomaterials, Advanced Technology and Innovation, TUL. She is currently in her third year of PhD studies supervised by Dr. Dvorak at TUL. Her research is focused on the use of the combination of nanomaterials and molecular-genetic methods to support biotechnology processes. In the last few years, she has participated in the solution of a few R&D projects and has so far published three research articles. In 2019, she did a 6-month internship in the Institute of Aquatic Ecology at the University of Girona, Spain.

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## Adverse reactions combination therapy MDR-TB using Bedaquiline

Since 2013, the Russian Federation has been using the new anti-TB drug Bedaquiline (Sirturo), whose mechanism of action is radically different from the existing anti-TB drugs. The drug has shown its high effectiveness in the treatment of drug-resistant tuberculosis. In phase III clinical trials, the bedaquiline group showed a significant increase in the number of deaths without an obvious causal factor, compared with the placebo group (12.7 vs. 2.5%). Despite the high efficacy of bedaquiline, community CRAG experts expressed concerns about the safety of the drug and said that more information on the safety of Bedaquiline was urgently needed.

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