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GSASET2023

2nd Global Summit on Applied Science, Engineering and Technology

March 23-24, 2023 **Rome, Italy**

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FOREWORD

Dear Colleagues,

It is our pleasure to invite all scientists, academicians, young researchers, business delegates and students from all over the world to attend the 2nd Global Summit on Applied Science, Engineering and Technology will be held in Rome, Italy during March 23-25 2023.

GSASET2023 shares an insight into the recent research and cutting edge technologies, which gains immense interest with the colossal and exuberant presence of young and brilliant researchers, business delegates and talented student communities.

GSASET2023 goal is to bring together, a multi-disciplinary group of scientists and engineers from all over the world to present and exchange break-through ideas relating to the Applied Science, Engineering and Technology.

COMMITTEES

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Plenary Forum
Day-1

Yehuda Shoenfeld, MD,FRCP,MaACR

Zabludovitzc Autoimmune Center ,Sheba medical center , Israel.

Post Covid-19 syndrome, vaccine ;Autoimmunity of the autonomic nervous system deciphers many enigmas

Covid-19 virus is an autoimmune virus and more notorious than EBV. It induces autoimmune diseases by hyper-stimulation combined with induction of autoimmune disease by molecular mimicry.

Post COVID-19 Syndrome (PCS) is a complex of various symptoms developing a month or more after the acute phase of the disease. The cases of PCS development among patients with asymptomatic/ mild forms are frequently reported; however, the pathogenesis of PCS in this group of patients is still not completely clear.
ThePCS develops on average in 30–60% of patients, mainly among women.
Fatigue, shortness of breath, cough, and anosmia were reported as the most common symptoms. The possible association between the described PCS symptoms and brain damage is noted. We assume the possibility of an alternative course of COVID-19, which develops in genetically predisposed individuals with a stronger immune response, in which it predominantly affects the cells of the nervous system, possibly
with the presence of an autoimmune component, which might have similarity with chronic fatigue syndrome or autoimmune dysautonomia.
We will discuss all the autoimmune ramifications of the virus, the CFS / fibromyalgia / post Covid syndrome.(1-7).

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Harry Heidecke…Avi Z. Rosenberg 24, Gabriela Riemekasten 13,25& Yehuda Shoenfeld 4,5,6,25
Autoantibodies targeting GPCRs and RAS-relate molecules associate with COVID-19 Severity. Nature Commun 2022

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Basic Sciences for Sustainable Development: 3D Nanoarchitectures – a Novel Class of Materials

Abstract

Extending nanostructures into the third dimension has become a vibrant research avenue in condensed-matter physics, because of geometry- and topology-induced phenomena. Modern advances of high-tech fabrication techniques have allowed for generating geometrically and topologically nontrivial manifolds at the nanoscale, which determine novel, sometimes counterintuitive, electronic, magnetic, optical and transport properties of such objects and unprecedented potentialities for design, functionalization and integration of nanodevices due to their complex geometry and non-trivial topology [1]. I will focus on three directions of key importance for sustainable developmentof technologies. Firstly, recently suggestedMöbius-stripmicrocavities [2] as integrable and Berry-phase-programmable opticalsystems are of great interest in topological physics and emerging classical and quantum photonic applications.Secondly, an efficient tailoringof acoustic phonon energy spectrum in rolled-up multi-shell tubular structures [3] opens up prospective applications in microelectronics, in cases when low heat conduction is required.Thirdly, prospect directions and challenges in the domain of superconductivity and vortex matter in curved 3D nanoarchitectures and their great potential for magnetic field sensing, bolometry, and information technology have been demonstrated [4]. A topological transition between the vortices and phase slips under a strong transport current is found in open superconductor Nb nanotubes with a submicron-scale inhomogeneity of the normal-to-the-surface component of the applied magnetic field [5]. This transition determines the magnetic-field−voltage and current−voltage characteristics, which imply a possibility to efficiently tailor the superconducting properties of nanostructured materials by inducing a nontrivial topology of superconducting screening currents. Dynamic topological transitions in open superconductor nanotubes occur under a combined dc+ac transport current [6]. The key effect is a transition between two regimes of superconducting dynamics. The first regime is characterized by a pronounced first harmonic in the Fast Fourier Transform (FFT) spectrum of the induced voltage at the ac frequency. It is typical of twocases, when the dominant area of the open tube is superconducting at relatively low magnetic fields and/or weak dc currents or normal at relatively high magnetic fields and/or strong dc currents. The second regime is represented by a rich FFT spectrum of the induced voltage with pronounced low-frequency components due to an interplay between thedynamics of superconducting vortices or phase slips and those driven by the ac.

Keywords

3D Nanoarchitectures; Geometry- and topology-induced phenomena;Self-rolled micro-and

nanoarchitectures;optical Möbius-strip microcavities;Topological transitions between vortex-chain and phase-slip regimes of superconducting dynamics; Rolled-up multishell tubular structures

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Biography

Vladimir M. Fomin, Research Professor at the Institute for Integrative Nanosciences (IIN), Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany is an internationally recognized expert in nanophysics. His research interests embrace: theory of 3D nano-architectures, in particular, physical properties of self-assembled nano- and microstructures (quantum rings, superlattices of quantum dots, rolled-up semiconductor and superconductor nanotubes), topological states of light in 3D nanoarchitectures, optical properties of quantum dots, phase boundaries, vortices and phase slips in meso-, nanoscopic and patterned superconductors; vibrational excitations and polaronic effects in nanostructures; thermoelectric properties of semiconductor nanostructures and transition metal dichalcogenides, propulsion mechanisms of catalytic tubular micromotors. Author of 6 monographs, including “Self-rolled micro- and nanoarchitectures: Effects of topology and geometry”, De Gruyter, 2021; “Physics of Quantum Rings” (Editor), Springer, 2014; 2nd edition, Springer International Publishing, 2018, 3 textbooks, 14 review papers, 10 patents and 213 scientific articles; h-index: 36.

Thomas J. Webster

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25 Years of Commercializing Biomaterials: Do University Start-Ups Really Work Or Can We Do Better ?

Abstract
As a University professor for over two decades, I was always led to believe that the only way to get my lab-based research commercialized into real products was to work with my University for technology licensing or starting a company. But does this model of commercializing academic research really work ? How many real commercial products have actually emerged fromUniversities ? Or is it all just a waste of time and money inhibiting academic researchers from helping real patients ? Is this system to commercialize academic research just a deterrent to getting some of our best ideas into the marketplace ? At some point, this system needs to be carefully assessed, as this talk will do.

Having formed over a dozen companies with several dozens of real commercial products currently implanted in humans, I have learned that there are better ways to commercialize research. This talk will cover four ways that I have specific experience commercializing technologies emphasizing the advantages and disadvantages of each. The four ways include: i) forming a traditional University start-up company, ii) developing a University degree program that starts companies, iii) licensing University owned technology to another company, and iv) forming a start-up company from technology released by a University.In particular, this talk will emphasize the promise the fourth approach can play to accelerate technology transfer into real commercial products.

This talk will discuss such commercialization efforts in the context of biomaterials and nanotechnology where using nanomaterials has been shown to significantly improve tissue growth, reduce infection, and inhibit inflammation all without the use of drugs. It will further look to the future of biomaterials in which new technologies, such as implantable sensors and 4D printing (3D printed materials whose shapes can be controlled remotely through near infrared), will revolutionize healthcare.

Keywords
Commercialization, nanotechnology, biomaterials, start-up companies.

Biography
Thomas J. Webster's (H index: 111; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health. Dr. Webster has numerous awards including: 2020, World Top 2% Scientist

by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); and is a fellow of over 8 societies.

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Tuning High Tc Superconductivity by Spin Orbit Coupling in Ferroelectric-Metal Superlattices of Quantum Wells

Abstract

We discuss here the recent advances in the field of first-principles quantum calculations for material design of high temperature superconductors made of artificial electronic heterostructures at 3 nanometers (nm) scale.I will review recent advances in 3 nm electronic technology making now feasible to match theory prediction and device functionality in the field of new quantum devices at high temperature. We present recent achievements on the cooperative interplay of the Rashba spin-orbit coupling (RSOC) joint with phonon mediated pairing at selected k-space spot (e-ph-pairing) to achieve high temperature superconductivitytuninginternal electric field in artificial heterostructures [1-4].We report how it is possible to design the superconducting dome in the artificial heterostructure of quantum units versus either RSOC and e-ph-pairing driven by Fano resonances due to quantum configuration interaction between open and closed pairing channels [2,3]. Our results provide a quantitativetool for material design of very high temperature superconductors [4] made of particular superlattices of quantum layers at 3 nm scale.

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Keynote Forum
Day-1

Ralph Kennel

Technical University of Munich-Germany

Predictive Control for Power Converters and Drives – Concepts and Trends

Abstract

The control of electrical power using power converters has been based on conventional, linear control theory – the algorithms are based on the principle of mean value, using pulse width modulation with linear controllers in a cascaded structure.

Recent research works have demonstrated that it is possible to use Predictive Control to control electrical energy with the use of power converters, without using modulators and linear controllers. This is a new approach that will have a strong impact on control in power electronics in coming decades.

The main advantages of predictive control are:

- Concepts are very intuitive and easy to understand.
- It can be applied to a great variety of systems.
- The multivariable case can be easily considered.
- Easy inclusion of non-linearities in the model.
- The resulting controller is easy to implement.

The participants of this invited speech will learn:

- The basic concepts and ideas.
- Why predictive controllers are simpler than conventional controllers.
- When predictive controllers are superior to conventional controllers.

Prof. Agostino Marengo

University of Foggia, Italy

The Promise and Challenges of AI Higher Education

Abstract

Artificial intelligence (AI) has the potential to transform higher education and universities environment and organisations to improve the learning experience for students.
From personalised learning platforms that adapt to each student's strengths (and weaknesses) to virtual tutors that provide one-on-one assistance and feedback, AI-powered tools (there are many of them right now on the market, open source and not) are revolutionising how we teach and learn and opening up new challenges for education.
This essay, written with the support of AI tools, will explore the top 5 AI tools in higher education today (some of that I am experimenting with at the Università degli Studi di Foggia) and discuss the benefits, risks and challenges of using AI in HE.
So whether you are a professor looking to incorporate AI into your teaching or a student interested in the latest developments in education technology, this article is for you.

Here are some of the top 5 AI tools that are being used in higher education today:

1. Adaptive Learning Platforms: These use machine learning algorithms to personalise the learning experience for each student.
2. Virtual Tutors: can assist students one-on-one, helping them understand complex concepts and complete assignments.
3. Grading and Feedback Tools: this can save instructors time by automatically grading assignments and providing feedback to students.
4. Course Recommendation Systems: systems that use machine learning algorithms to recommend courses to students based on their interests and goals.
5. Language Learning Tools: AI-powered language learning tools can help students improve their foreign language skills.

Let's explore them all.

Invited Forum
Day-1

Ketevan Jerenashvili
(Technical University of Georgia, Tbilisi, Georgia)

Cobiax Systems, Implementation and Development Trends in Georgian Composite Basalt Production

Abstract

Issues of creation, introduction and development trends of composite materials, relevance of their use in construction, modern condition and perspectives. The main types of composite building constructions, methods of construction of details, connections and specifications, operation, economic aspects. External reinforcement systems of flexural and compressive elements of reinforced concrete, polymer, composite reinforcements, Cobiax systems, issues of fracture mechanics of composites are covered, numerical examples of calculation are given (1).

More attention is focusedon rebar rods and grids made of Georgian basalt in Georgia. St. Melting of basalt stone, assembly of primary thread into roving, winding on a drum, production nomenclature of the products produced at the “Basalt Fiber” enterprise in Rustavi.

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Herman Potgieter

Manchester Metropolitan University, UK

Heterojunction Mediated Photodestruction of Thiocyanate in Aqueous Solution

Abstract

For a long time, mining industries have utilized cyanidation which produces thiocyanates as the main leaching method in the gold mining industry. Thiocyanate production is an unwanted problem which makes it difficult for wastewater to be discharged and recycled, in addition to their stability which makes it difficult to reduce/eliminate thiocyanates in mining waste water. Herein, a p-n heterojunction of ZnO and BiOI were fabricated, characterized and applied for the photodegradation of ferric thiocyanate under solar simulation. Observations from scanning electron microscopy, energy-dispersive x-ray spectroscopy, x-ray diffraction, optical studies and nitrogen adsorption-desorption isotherm showed high porosity with sponge-like morphology and agglomeration, only the presence of the reference elements, crystalline patterns with no impurity peaks, slight red shift in the absorbance of the heterostructure and Type IV isotherm, respectively. The synthesized heterostructure completely destroyed ferric thiocyanate in less than 30 minutes. The variation of different process parameters showed that the degree of photodegradation of the pollutant is influenced by the initial pollutant concentration which diminishes with increasing initial ferric thiocyanate concentration. The best photocatalytic activity was observed at pH 7. The pseudo first order kinetic model showed that when the catalyst dose was increased to 15 mg, the rate constant increased from 0.188 - 0.420 min-1, while raising the pH to 10 led to a 3.5-fold reduction. The R-squared (R2) values affirm that all the photocatalytic experiments in this study followed a pseudo-first order kinetic model. The findings from this study could potentially be useful to mining industries for the elimination of cyanide and thiocyanates in mining waste water.

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Searching for Sources of Water Pollution in the Adjara Region

Abstract

The problem of water pollution is becoming more and more urgent for the world. Despite the measures taken, improving the methods of wastewater treatment, the issue remains relevant. One of the most common is biological pollution, directly related to the ingress of pathogenic microorganisms, bacteria, viruses and protozoa into the water.

Unfortunately, Georgia is not an exception, where water sources are abundant and a significant part of them is polluted.

Unlike pollution from industrial waste treatment facilities, which comes from many diffuse sources, biological pollution is caused by the movement of sediments to the surface or subsoil. As runoff moves, it collects and carries natural and man-made pollutants and deposits them into rivers, groundwater, or lakes.

Special attention should be paid to the biological pollution of water sources, which is formed as a result of rain and melt water washing or flushing of sources of anthropogenic biological pollution. After getting into the water environment, under favorable conditions, pathogenic organisms can multiply quickly, which poses a threat to the environment.

Contamination of water sources is a major cause of water quality problems. The effects of source water contaminants on specific waters vary and may not always be fully appreciated. However, we know that these pollutants have harmful effects on drinking water supplies, recreation, fisheries and wildlife.

That is why it is necessary to find the source of biological pollution of water, to study it both on its aging and its lethality, in order to develop an effective method of pollution elimination.

Keywords

water source, water poluttion, study, Adjarian region, Georgia

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Albio D. Gutierreza

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A Numerical Model for the Combustion of Densified Agricultural Residues (Dar) from Sugar Cane Cutting in Grate-Fired Boilers

Abstract
A numerical model is built toassist the development and implementation of densified agricultural residues (DAR) from sugar cane cutting for combustion applications in grate-fired boilers.The numerical model is based on the finite volume method (FVM) to consider turbulent fluid motion, species transport and the conservation of energy, including thermal radiation.The porous media flow through the fuel bed is also considered as a function of the particle size, shape, and bed porosity. DARdevolatilization and char consumption rates are modeled based on the pyrolysis characteristics and kinetic parameters determined experimentally by our group. The model is utilized to assist the design of a 50kW lab-scale furnace resembling the main characteristics of the most common grate boiler types utilized in the sugar cane and paper mill Colombian industries. The model is also used to explore the behavior of a 70 MW coal-fired grate boiler from a local facility if it will operate on fuel mixtures of coal and DARfrom sugar cane cutting.The simulations areperformed in the commercial software STAR-CCM+ and solved for different scenarios by utilizing high performance computing (HPC) resources in the cloud. Energy release, combustion temperature and flow conditions are reported and analyzed for different percentages of coal and DAR blends.The results show that blendsof coaland DAR from sugar cane cutting present satisfactory characteristics in terms of energy release and temperature levels for combustion applications in coal-fired grate boilers.

Keywords
Biomass combustion; Densified agricultural residues; Grate-fired boilers, Computational fluid dynamics (CFD); High performance computing (HPC).

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Modern Digital Control Systems For Architectural And Construction Design Managementand Their Socio-Economic Efficiency

Abstract

Presented processes and practical results of informational BIM-modeling of buildings with modern digital control systems of architectural and construction design, for calendar planning and optimization of construction. Processes of informational modeling of buildings and practical results implemented on buildings under construction in the city of Tbilisi1 of LTD “Modernline”. The methodology is based mainly on the analysis of practical works of foreign scientists and domestic research and design architectural and construction firms.For the study, the main provisions of the theory of CAD construction, the theory of building information modeling BIM, methods for integrating software products and information systems, the theory and methodology of project management, evolutionary methods for solving optimization problems, in particular genetic algorithms of GA, were used.Studies were carried out to verify and confirm the effectiveness of the proposed modification of genetic algorithms.

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Fundamental Insights into Novel Heterogeneous Polysaccharide-Based Metal Catalysts

Abstract
Polysaccharides derived from biological sources have attracted a lot of attention in the scientific community. Besides their renewability and biodegradability, the diverse functional groups and unique physicochemical properties of these bio-based materials make them a promising environmentally friendly alternative to synthetic polymers. Even though these molecules seem to be attractive materials, their full potential in heterogeneous catalysis is yet to be revealed. To this end, we developed novel, simple and sustainable catalytic systems that were proven to be alternative systems to other used and known heterogenous catalytic systems. The new catalysts were tested in the Suzuki cross-coupling of halobenzenes and phenylboronic acids, and were also analysed using various techniques including: FTIR, SEM-EDS, XPS, SEM, BET, DLS and TEM analysis.It was found that the catalysts supported on iota-Carrageenan were successfully used without leaching, yielding a high activity rate. Moreover, the heterogeneous systems could be easily removed from the reaction mixture and recycled.

Keywords
Heterogenous catalyst;Polysaccharides; Support;Suzuki

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Biography
Oshrat Levy-Ontman isa chemical engineering senior lecturer at Shamoon College of Engineering.She earned her Ph.D. in Biotechnology Engineering from Ben-Gurion University of the Negev,exploring novel N-glycan structures in cell-wall glycoproteins of red algae. Later, she went on tobuild her own research group, which focuses on identifying the potential of renewable and biodegradable organic polymers in biotechnological applications and on developing different methods for the use of renewable polysaccharides as supports for homogeneous catalysts that will be superior to those currently used in terms of performance, cost effectiveness, greenness, ease of synthesis, and recycling.

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Ofra Paz Tal2
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[2]Department of Chemistry, Nuclear Research Center Negev, Beer Sheva, Israel

Detection of Trace Contaminants on Dense Surfaces using "Smart" Strippable Coating Formula: Colorimetric and Vibrational Spectroscopy Study

Abstract

Decontamination of nuclear facilities from labile and fixed contamination from different surfaces is a subject of increasing importance in a wide variety of industrial applications. Decontamination using strippable coatings are advantageous over existing traditional decontamination methods owing to their relative ease of application, effective physical isolation of contaminates and rather low cost and minimization of secondary waste. It is thus not surprising that the demand for more sophisticated, state of the art, decontamination processes has shifted the scientific interest towards improving strippable coating methods.
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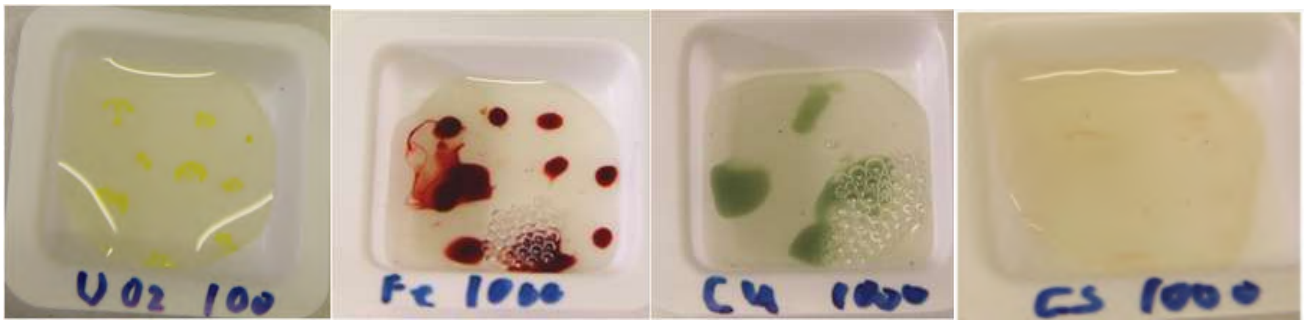

This study represents the synthesis and characterization of a novel strippable polymeric coating based on Polyvinyl alcohol (PVA) aqueous solutions embedded with TTA (2-thenoyl trifluoroacetone) ligandwhich is proved to form stable complexes with various metal ions.The TTA-PVAsolution was applied to several contaminated surfaces comprising various concentrations of metal ions, such as, UO2+2, Cu+2, Fe+3, Cs+ contaminants. We found that the TTA ligand contained in this solution interact with the above contaminants, which are drawn and fixed into the polymer matrix, accompanied by a consequent indicative strong color change.The dried coating film can then be easily exfoliated leaving the surface decontaminated.

Furthermore, by combining ATR-IR and Raman spectroscopy, we explore the details of the interaction of the individual contaminant with the novel strippable coating, and provide a clear spectroscopic signature of the metal-ligand interaction. Overall, the obtained contaminant dependent color change and spectroscopic results allow for an easy and rather fast detection of concentrations lower than 0.5 μg·cm-2.

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Method Optimisation and Application Based on Solid Phase Extraction of Non-Steroidal Anti-Inflammatory Drugs, Antiretroviral Drugs, and a Lipid Regulator from Coastal Areas of Durban, South Africa.

Abstract

This study presents an optimized method that is applicable in monitoring the occurrence ofpharmaceuticals in a wide range of aquatic environments. The optimised Solid PhaseExtraction (SPE) method is based on Bond Elut Plexa cartridges for the identification andquantification of three non-steroidal anti-inflammatory drugs (NSAIDs), three antiretroviraldrugs (ARVs) and a lipid regulator in the coastal area of Durban city, South Africa coveringfour seasons. The extracted compounds are qualitatively and quantitatively detected by ahigh-performance liquid phase chromatographic instrument coupled to a photodiode arraydetector (HPLC-PDA). The recoveries range from 62 -110% with a Relative StandardDeviation (RSD) of 0.56 to 4.68%, respectively, for the determination of emtricitabine,tenofovir, naproxen, diclofenac, ibuprofen, efavirenz, and gemfibrozil. The analytical methodis validated by spiking estuarine water samples with 5 µg L -1 of a mixture containing thetarget pharmaceuticals and the matrix detection limit (MDL) is established to be 0.62-1.78 µgL -1 for the target compounds. The optimized method is applied to seasonal monitoring ofpharmaceuticals at chosen study sites from winter and spring of 2019 and summer andautumn of 2020. The results indicate the concentration of the pharmaceuticals studied varieswith the type of aquatic environment and season.

Invited Forum
Day-2

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Hybrid Functionsand Fractional Calculus in Science and Engineering

Abstract

Sets of orthogonal functions can be divided into three classes.The first class includes sets of piecewise constant basis functions (e.g., block-pulse,Walsh, etc.). The second class consists of sets of orthogonal polynomials(e.g., Chebyshev, Legendre, etc.). The third class is the set of sine-cosinefunctions in theFourier series. While orthogonal polynomials and sine-cosinefunctions together form a class of continuous basis functions, piecewise constantbasis functions have inherent discontinuities or jumps. In recent years, the hybridfunctions consisting of the combination of block-pulse functions with orthogonalpolynomials or polynomial series have been shown to be a mathematical power toolfor discretization of selected problems.

Fractional differential equations (FDEs) are generalizations of ordinary differential equations to an arbitrary (non-integer) order. FDEs have attracted increasing attention and interest due to their ability to model complex phenomena. Generally speaking, most of the FDEs do not have exact analytic solutions. Therefore, finding numerical solutions to these equations are very important.

In this talk, first an introduction to the hybrid functions and their applications in fractional calculus are given. Then, an efficient numerical method based on hybrid functions for solving the FDEs is presented. The numerical solutions are compared with available exact or approximate solutions to assess the accuracy of the proposed method.

Keywords

Hybrid functions; block-pulse; fractional calculus; numerical methods

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Biography

I am a Giles distinguished professor at Mississippi State University and had three Fulbright Awards in Romania. I have been a department head since 2006. My research area is in Applied & Computational Mathematics, which ranges from developing, analyzing, and implementing mathematical models and numerical methods from sciences and engineering. I am particularly interested in optimal control, fractional calculus, hybrid functions, and wavelets. I introduced a novel “hybrid functions” method by combining piecewise and continuous basis functions. I was the first to use Legendre wavelets for approximating solutions to problems in dynamic systems with jumps and discontinuities. I have over 225 publications in high-quality international journals in applied mathematics, mathematical physics, and engineering. My student, Gamal Elnagar, was the first to receive a Ph.D. in Mathematical

Sciences at Mississippi State University. His thesis work resulted in eight publications; one article co-authored with me has been cited over 800 times.

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In-Situ Radiological Assessment of Background Gamma Radiation Dose Rate of Gidan-Kwano Campus of Federal University of Technology, Minna, Nigeria.

Abstract
Radiation has been acknowledged to be one of the factors responsible for deleterious conditions in living tissues. Hence, environmental background gamma radiation measurement is necessary from environmental and health perspectives. In this study, the assessment of the background radiation dose rate in the Gidan-Kwano campus of the Federal University of Technology, Minna, Niger State, Nigeria is presented. An in-situ measurement of the background radiation level was carried out using a well calibrated portable handheld NaI(Tl) scintillation survey meter at an elevation of 1.0 m above ground level. A geographical positioning system Garmin (GPS) was adopted for geographical location. A total of 147 points were surveyed across the study area for background environmental radiation. The results obtained varied significantly due to geological formations of the study area. Background radiation dose rate level values ranged between 87 – 252.3 nGyh-1 with overall mean value of 142.34 nGyh-1.The average measured dose rate was more than twice the reported world average value of 59 nGyh-1(UNSCEAR, 2000). The calculated mean value for the annual effective dose equivalent is 0.17 mSv/y, which is below the 1 mSv/y permissible limits as recommended by International Commission on Radiation Protection (ICRP) [2]. Similarly, the mean value of 0.57 x 10-3 for the excess lifetime cancer risk(ELCR) exceed the average world value of 0.29 x 10-3. The implication of the AEDE and ELCR values is that the Gidan-Kwano area of Minna, Niger State, Nigeria is radiologically safe for any immediate radiological health burdens that might arise due to absorbed dose rate from background radiation, but the probability of one developing cancer over a lifetime exposure around the area is highly possible.

Keywords
Background radiation; radiological safety; cancer risk; gamma-rays.

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On the Representation of a Solution for the Perturbed Quasi-Linear Controlled Neutral Functional Differential Equation

The neutral functional differential equation is a mathematical model of such system whose behavior at a given moment depends on the velocity and state of the system in the past. Many real processes are described by neutral functional differential equations and the theory of such equations is presented in [1-3]. In this work, for the controlled neutral functional differential equation $x\&(t) = A(t, x(t), x(t-h))x\&(t-\sigma) + f(t, x(t), x(t-\tau), u(t))$,
with the initial condition
$t \in [t0, t1]$

$$x(t) = \phi(t), \quad t < t0, \; x(t0) = x0$$

we prove the analytic representation formula of a solution – Variation formula of solution, which is obtained in the left neighborhood of the endpoint of the main interval. In the formula, the effects of perturbations of the delay parameters h, σ, τ, the initial vector x_0, the initial $\phi(t)$ and control $u(t)$ functions are detected.
In the particular case, when the matrix function $A(\cdot) \equiv 0$, Variation formulas of solutions for different type of delay functional differential equations are proved in [4,5].
Theorems of such a type play an important role in studying optimal control problems, proving of the necessary conditions of optimality.

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Poster Presentation

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Synthesis of Manganese complex of Tanic acid in green method

Abstract

Tannic acid is a specific commercial form of tannin, a type of polyphenol. Its weak acidity (pKa around 10) is due to the numerous phenol groups in the structure. The chemical formula for commercial tannic acid is often given as C76H52O46. Its structure is based mainly on glucose esters of gallic acid. It is a yellow to light brown amorphous powder which is highly soluble in water. Tannic acid is a basic ingredient in the chemical staining of wood. The tannic acid or tannin is already present in woods like oak, walnut, and mahogany. Today tannic acid is used in pharmaceutical applications to produce albumine tannate which is used as an anti-diarrhea agent. They found that Tannins have also been reported to exert many physiological effects, such as to accelerate blood clotting, reduce blood pressure, decrease the serum lipid level, produce liver necrosis, and modulate immune responses. Tannic acid due to its extensive donating centers can act as very good chelator. Already tannic acid complexes of copper and Iron were reported. In diagnostic medical science tannic acid is used for detecting peptic ulcer where Technetium-99m is used as the main radio active metal. In this work Mn complexes of tanic acid has been synthesized as Mn belong to the same group of Tc. The Complex is polymeric in nature which is insoluble in all common solvents. The complex is paramagnetic with only one unpaired electron which was proved by electron spectra

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Supercritical Glycolysis of Waste Polyurethane Foamfor SynthesisChemicals and Solid Recovery Fuels

Abstract
In Taiwan, the insulated polyurethane foam (PUF) produced by waste home appliances and automobile dismantling industry are mainly treated by incineration. However, the incineration and combustion of PUF itself will cause serious air problems (hazardous air pollutants (HAPs), polycyclic aromatic hydrocarbons (PAHs), dioxin HCN etc.), especially the release of harmful substances (brominated flame retardants) and lead to a valueless recycle in the resource utilization. Furthermore, in order to increase the benefit of circular economy and reduce the loading of emission from the incinerator, the purpose of this study is to construct a subcritical glycolysis technology (SGT) to convert the recycled PUF into liquid products and solid residues. The high-value chemicalscan be distillated and extractedfrom the liquid products and then they canbe used as raw materialsof PUF synthesis and the residuescanbe supposed assolid recovery fuels (SRF) for the replacement of coal in power plant. This informationcanbeintroducedtomany industry applicationsandalso can be proved to enhance the totallyutilization of PUF.

Keywords
Polyurethane foam, circular economy, subcritical glycolysis, recycled materials, ether polyol, synthesis

Biography
In 2004, Je-Lueng Shie joined the Department of Environmental Engineering in National I-Lan University, Taiwan, where he has been a full professor in 2012, and distinguished professor in 2017. Dr. Shie works in the environmental field of biomass/waste conversion for biofuels, air pollution control and negative carbon technology. Since 2000, He made over 275 scholarly contributions including nearly 95 SCI/EI publications, 127 conference papers, 44 technical reports, 7 patients and 2 technology transfers. In 2016, he assisted in the establishment of National Organization “Taiwan Bio-energy Technology Development Association, TBTDA”, and serving as executive director to provide technical and professional suggestions to environmental and bio-energy industries in Taiwan.

At the same time, he also teamed a scholarly group to promote the cooperation of industries and government for the carbon neutrality or net-zero emissions in Taiwan.

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Antioxidant, Enzyme, and H2O2-Triggered Melanoma Targeted Mesoporous Organo-Silica Nanocomposites for Synergistic Cancer Therapy

Abstract

The multi-stimuli responsive drug delivery system has recently attracted attention in cancer treatments, since it can reduce several side effects and enhance cancer therapeutic efficacy. Herein, we present the intracellular antioxidant (glutathione, GSH), enzyme (hyaluronidase, HAase), and hydrogen peroxide (H2O2) triggered mesoporous organo-silica (MOS) nanocomposites for multi-modal treatments via chemo-, photothermal, and photodynamic cancer therapies. A MOS nanoparticle was synthesized by two-types of precursors, tetraethyl orthosilicate (TEOS) and bis[3-(triethoxysilyl) propyl] tetrasulfide (BTES), providing large-sized mesopores and disulfide bonds cleavable by GSH. Additionally, we introduced a new β-cyclodextrin-hyaluronic acid (CDHA) gatekeeper system, enabling nanocomposites to form the specific interaction with the ferrocene (Fc) molecule, control the drug release by the HAase and H2O2 environment, as well as provide the targeting ability against the CD44-overexpressing melanoma (B16F10) cells. Indocyanine green (ICG) and doxorubicin (Dox) were loaded in the MOS-Fc-CDHA (ID@MOS-Fc-CDHA) nanocomposites, allowing for hyperthermia and cytotoxic reactive oxygen species (ROS) under an 808 nm NIR laser irradiation. Therefore, we demonstrated that the ID@MOS-Fc-CDHA nanocomposites were internalized to the B16F10 cells via the CD44 receptor-mediated endocytosis, showing the controlled release by GSH, HAase, and H2O2to enhance the cancer therpeutic efficacy via the synergistic chemo-, photothermal, and photodynamic therapy effect.

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Roughness Levels of Woven Fabrics

Abstract
In woven fabrics, the typical topography is expressed by the periodic repetition of waves in the vertical and horizontal directions resulting from its structure. The term roughness refers to height differences in the range of variations on the fabric surface, quantified by deviations in the direction of the normal vector of the actual surface from its ideal shape, and is characterized by the height and width of the wave. The roughness profile is a profile derived from the primary profile neglecting the long-wave components using a profile filter. Each parameter is classified according to the primary profile (P), roughness profile (R) and waviness profile (W) to categorize different aspects of the profile. To process the data from the primary profile, it is necessary to create a roughness profile, which is done by filtering. It is necessary to select the appropriate wavelength of the section (cutoff line), which separates the roughness from the waviness. In the case of fabric at the level of weave, threads, thread morphology.

In the experimental part of the work, samples in plain and satin weave were examined, with the same warp and weft densities. By selecting two cutoff values, two profiles were obtained for each sample. The first profile includes only wavelengths less than the cutoff line (1.02 mm) equal to the length between the two weft threads increased by 10%. The cutoff of the second profile is determined by estimating the one wavelength of the approximated path of one thread in the fabric passing along one weave unit of fabric increased by one thread. A comparison of the filtered profiles shows a similarity between the two profiles in both samples, which suggests that the roughness of the fabric is more influenced by the density of the threads than the fabric weave.

Keywords
woven fabric, roughness, waviness, FTT

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Biography
After graduation, she joined the Faculty of Textile Technology at the University of Zagreb in 2020, at the Department of Textile Design and Management, where she still works today as a project associate on project “Development of multifunctional non-flammable woven fabrics for dual purpose”, funded by the EU from the ERDF. In the same year, she enrolled the postgraduate doctoral study Textile Science and Technology at the Faculty of Textile Technology in Zagreb.

This work has been supported by the European Union from the European Regional Development

Fund under the project KK.01.2.1.02.0064 Development of multifunctional non-flammable fabric for dual use.

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3D printing and functionalisation of scaffolds and implantsforcraniomaxillofacial applications

Abstract

The custom made approach for the production of scaffolds and implants for craniomaxillofacial applicationsis achieving a lot of interest, promoting the use of additive manufacturing technologies [1]. Indeed, it showsmany advantages with respect to the traditional approach, e.g., higher aesthetical results, reduced morbidity,shorter surgery times, less blood loss, better correspondence between the implant and the graft site, lowerinfection/inflammationrisk[2].Inthiscontext,scaffoldsandimplantprototypesweredesignedandprintedbyfused deposition modelling (FDM) technique, in order to overcome the criticisms revealed in the case ofcommonlyusedbiopolymericimplants,i.e.inductionofinflammation,lackofosteointegration,lowmechanicalproperties.Theprintingofdifferentbiopolymers(e.g.,polymethylmethacrylate(PMMA),polylactidacid(PLA),polycaprolactone(PCL))wastried,selectingdifferentparametersanddifferentpatterndepositions [3-5]. The functionalization of the produced structures with calcium phosphates and selectedantibiotic/anti-inflammatory agents was performed to promote the osteointegration and to avoid the postsurgery inflammation occurrence, respectively. The produced structures were fully characterized from aphysico-chemical,thermal,microstructuralandmechanical pointsofview,bydifferentialscanningcalorimetry (DSC), observation at optical and scanning electron microscopies, and tensile and compressiontests, respectively. The efficacy of the coating deposition procedure was demonstrated by observation atscanning electron microscopy (SEM), and infrared spectroscopy (FTIR/ATR) measurements. The controlledrelease of the chosen anti-inflammatory agents was studied. The biological behavior was investigated by invitrocytotoxicitytests, aswellasosteoblasticdifferentiation testswithosteosarcoma cells.

Acknowledgements

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Federica Bertocchini

Peases from the Wax Worm

Pollution from plastics such as polyethylene (PE), polystyrene (PS) and polypropylene (PP) is causing serious damage to the environment, posing a dangerous risk for human health in the near future. The quest for working solutions is becoming an urgent matter in view of the steady increase in plastic production. In the past few decades plastic degradation by biological systems has been considered a potential path to get rid of plastic waste, a path revived by the discovery that some insect larvae were capable of degrading PE and PS. Nonetheless, the identification of the culprit within the larvae, therefore the possibility to develop a biotechnological tool, has been elusive. Recently, the wax worm, as the larvae of lepidopteran Galleria mellonella is called, provided the solution to this conundrum: the saliva resulted to be the mean by which the animal can degrade PE within a few hours from exposure. Two enzymes within the saliva of the wax worm and produced by the worm itself are responsible for this effect. Could these two newly discovered PEases be the gateway to the solution for the plastic pollution plague?

Virtual Presentations

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How to provide scientificand informative content for cultural heritage tourism through projection mapping technology

Abstract
With the rapid development of interactive technologies using projection mapping (PJM), these digital technologies have introduced new interpretative possibilities for presenting cultural heritage sites. PJM attracts more visitors with greater expectations of cultural heritage sites through its excellent visual effects and guidance capabilities. In the past decade, especially after 2015, design events have frequently introduced digital projections to cultural heritage sightseeing spots worldwide. However, this trend has also led to the emergence of many digital projection events that merely exhibit beautiful projection effects on buildings and neglect to show the history and value of the cultural heritage site, and various researchers have attempted to evaluate the effectiveness of PJM on the visitors' experience and generate proposals for improvement. Unfortunately, the general state of PJM application at cultural heritage sites and potential improvements are still not sufficiently discussed. Meanwhile, the necessity for guidelines on PJM utilized in heritage sites and an evaluation system for visitors" experiences are becoming more critical to the industry.

Therefore, the researcher prompt enormous case studies and investigations of PJM applications at cultural heritage sites around the world, and two information characteristics of PJM at cultural heritage sites can be observed: "the relationship between projection content and heritage" and "information tendency." The advantages and limitations of these characteristics were distinguished and suggestions for applying PJM on cultural heritage sites were derived.

Keywords
Digital cultural heritage, Cultural heritage sites, Projection mapping, Visual Technology Applications

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Fintech impacting Stock Market: BIZUM

Abstract

BIZUM is a digital real time payment solution that enables users to conduct Person-to-Person payment through a mobile phone. It was implemented in 2016 by 27 Spanish banks as a joint initiative to stay competitive in an increasingly disruptive Fintech Startup environment.Since BIZUM is a relatively disruptive technology, this article reviews the effect of BIZUM, on the volatility of the of the Spanish stock market after BIZUM was launched.

For the purposes of this study, daily returns of the Spanish stock market benchmark, the IBEX35, for the period from 03/10/2015 to 03/10/2017 were selected and a GARCH–M GED approach with an event-related dummy variable was used, to capture the predictable components of the volatility change in the Spanish stock market as BIZUM started to operateon October 3, 2016.

The result indicates that BIZUM has an impact on the Spanish stock market, by significantly decreasing the volatility of the IBEX35 index in terms of their variance, which let us to the conclusion that the Spanish stock market reacted positively to the implementation of BIZUM as aFintech strategy in terms of risk perception.

These results are in line with the argument that Fintech will complement incumbent firms. The practical contribution is especially relevant sine it suggests that investors were informed about the advantages of BIZUM and expected volatility to decrease. This result supports rational investor behaviour.

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N. B. Potadar*

Ramnarain Ruia Autonomous College, Mumbai December 27, 2022

Equilibrium Solutions of Free Boundary Value Problems for Parabolic PDE

Abstract

Equilibrium solutions of free boundary value problems are considered in the following talk. Support of a solution of certain evolution type equations themselves evolve in time and it is important to keep track of the boundary of a support of a solution when it evolves in time. For problems like Stefan problems method of lines is found to be useful when time derivative is approximated by backward differences. Solutions along with evolving boundaries of the support of solutions are studied well in the literature. We propose to discuss comparative study of the method of lines when time derivative is approximated by approximations other than backward difference schemes and equilibrium solutions of parabolic free boundary value problems when different stencils are used. We believe that different stencils may require different approaches when it comes to the question of analyzing equilibrium solutions of these problems. Difficulties in identifying correct function spaces in these type of problems will also be touched upon during the talk.

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The counter-part of linearity in non-associative realm

Abstract

Functional analysis theory is a very important direction in the field of theoretical researchand applied science. It has been generalized into the non-commutative case, that is, the quaternionic functional analysis. As shown by Hurwitz's theorem, there are only four kinds of division algebras over the real number field. They are the real field, complex field, quaternions and octonions. The research of octonionic functional analysis theory is still a blank space. Although Goldstine and Horwitz introduced the definition of octonionic Hilbert space in 1964, they failed to establish the Riesz representation theorem in octonionic Hilbert space. Thereafter, the study of octonionic functional analysis stalled for a long time. Recently, we introduced a new notion of para-linear functionals utilizing associators and established the Riesz representation theorem for octonionic para-linear functionals. This indicates that the objects in octonionic functional analysis are octonionic para-linear operators rather than octonionic linear operators, the counter-part of linearity in non-associative realm should be para-linearity. This talk will give a short introduction for the notion of para-linearity.

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Social Behaviour, Distribution Patterns, Vegetation Dynamics and Fitness Response in Beef Cows Grazing Semi-Arid Natural Pasture

Abstract

Real time animal-grazeland data and its integrativeanalysis,is crucial for management optimization inextensive production systems.We present anintegrationofcows' automatic monitoring system and machine learning based pasture classification,in a semi-arid naturalpasture, sustaining 150 free-grazing lactating beef cows.Social behaviour was studied using automatic activity monitoring, direct observations and GPS tracking.Pasture was classifiedusing deep neural network analysisbased on drone photogrammetry, validated by chemical analysis of vegetation samples. Proximal spectral measurements were takenfor green, dry and mixed vegetation, resulting with specific spectral signatures, suggesting a potential forremotely sensedvegetation quality indicators. Spatial and temporal pasture patchiness was mapped andassociated with cows' location and foraging observations, suggesting possible optimization through grouping and resource allocation strategies. Social behaviour analysessuggested self organizing systems theory as a descriptive model for grazing cattle rather than dominance hierarchy.Thus, distribution patterns and activities' schedule were associated withherd cohesion driversrather than individual behaviour. Fitness response was positively correlated with proximity interactions, steady activity pattern, consistent choice of co-travellers in grazingbutinconsistency in foraging route choice. Fitness was negatively correlated with foraging routes' length.

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Solutions differential equation with delays and advances

Abstract
Differential equations with mixed (delayed and advanced) arguments constitute an important class of functional differential equations and have applications in various fields of science and engineering, in particular, in financial mathematics, control problems, population dynamics, and neural networks. The situation when the rate of the current change relies on both historical data and predicted values, is quite typical in mathematical economics. However, this class of equations has been much less studied than other classes of functional differential equations. So, here it will be considered a differential mixed type equation and introduce some sufficient conditions when a unique bounded solution defined on exists.

Keywords
Differential equations, delay equations, advanced equations, applications.

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Biography
Ph.D., in 2007, in Mathematical Analysis at the Azores University

More than 150 scientific publications with referee in international journalsand author of 1 book. Editor of 8 Springer's Proceedings Books

Member of 10 editorial boards of international journals and referee of more than 40 international journals.

Participation on more than 50 international conferences (20 as Invited Speaker) and member of the organizing board of more 40 international conferences (10 as chairwoman).

Adjudicator of more than 30 Ph.D. Thesis

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Exploration of Chemistry and Experimental Representatives for Vickers Hardness Prediction Using Machine Learning Approaches

Abstract
Hardness is an important property in superalloys for high-temperature applications. In this talk, I will discuss data-driven approaches to predict the Vickers hardness in Co- and Ni-based superalloys using machine learning (ML). Conventional and advanced image processing tools are implemented to quantify the microstructural variations with composition and processing conditions. Two different and noble image processing methods are implemented to quantify the scanning electron microscopy (SEM) images of Co- and Ni-based superalloys into descriptors for ML models. Image processing tools are employed to extract phase information and geometrical patterns from the experimental SEM images. The conventional approach extracts geometrical features such as volume fraction, area, and perimeter of the phases from the microstructures. Whereas the advanced approach uses statistics based 2-point correlations and principal component analysis (PCA) to quantify the microstructural variations. The microstructural features extracted from both these approaches are used to develop two independent ML models. Gaussian process regression (GPR) models trained on these microstructural descriptors, alloy compositions and processing conditions results in high prediction accuracies. Both the methods reveal a very good prediction of Vickers hardness with a higher R^2 greater than 95% and lower rmse less than 0.16 HV. Further analysis of the model presents numerous in-sights into composition-structure-property (C-S-P) relationships, which will be also discussed. The ML models developed can be generalized for any mechanical property of interest and can be utilized for accelerated development of new generation of high temperature superalloys.

Keywords
Superalloys, Machine learning, Principal Component analysis, Vickers hardness

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Biography
I am a PhD student under the supervision of Prof. Abhishek Kumar Singh at Materials Research Centre, Indian Institute of Science, Bengaluru, India. My area of interest is focused on the establishment of structure-property relationship in materials using first principles and machine learning methods. I work on the development of unique and noble featurization techniques to represent material structures uniquely and map to the target applications. I also study atomistic simulations in materials to understand the interfacial behavior of interconnects for various applications.

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Construction of Smart Megacities Empoweredby the Internet of Things and Artificial Intelligence Technologies -- A Practice Study in Shanghai

Abstract

AIoT integrates AI technology and IoT technology to generate massive data of different modes through the Internet of Things, and realizes the interconnection of all things with the help of networking, computing, big data analysis and artificial intelligence.The AIoT technologies are rapidly infiltrating into life and production. In this speech, we will report our research work on AIoT technologies and their applications in the field of urban intelligent computing, and focus on discussion of the applicationsand practices of our research results in the planning and construction of smart cities in super large cities such as Shanghai, mainly including two aspects: First, how to build, test and evaluate the new-generation metropolitan AIoT network as the digital infrastructure of smart city; Second, how to utilize the AIoT network to more effectively deal with the problems of refinedurban management and precise urban governance in typical intelligent application scenarios.

Biography

Dr. Xinli Huang is currently a Full Professor with the School of Computer Science and Technology of East China Normal University (ECNU), Shanghai, China. He received his Ph.D. degree in Computer Science from the Department of Computer Science and Engineering of Shanghai Jiao Tong University (SJTU), Shanghai, China, 2007. In 2011, as a visiting scholar, he visited the Computer Science Department of University of Texas at San Antonio (UTSA), TX, USA. For the past few years, he has conducted research activities in a wide spectrum of hotspots in the fields of advanced networking and smart computing. His current activities and research interests are focusing on the fields of Internet of things, artificial intelligence, edge computing, and, in particular, their applications in real-world scenarios including urban intelligent computing and smart city. His research has been supported by multiple national- and provincial-funded scientific foundations, and multiple industrial grants from enterprises. He has published more than 40 papers in leading international journals and conferences, and has served as program committee member or technical reviewer of numerous international journals and conferences.

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Citrus huanglongbing biocontrol with indigenous endophytes; Assessment of host defense response against Candidatus liberibacter asiaticus

Abstract
Citrus huanglongbing (HLB) is one of the irrepressible citrus tree diseases results in devastating loses to citrus industry. The increasing incidences of citrus huanglongbing caused by phloem colonizing and exotic infectious pathogen Candidatus Liberibacter asiaticus (CLas) are causing worldwide concern and frustration. Endophyte-mediated manipulation could play an important part in restoration of potential endophytic microbiome to positively influence the citrus defense. Restoration of the affected microbial communities in the diseased host through introduction of an indigenous endophyte Bacillus subtilis L1-21 isolated from healthy citrus, may provide an innovative approach for the disease management. A novel half-leaf method was developed in vitro to test the efficacy of the endophyte L1-21 against CLas. Application of B. subtilis L1-21 at 104 cfu ml-1 resulted in a 1000-fold reduction in the CLas copies per gram of leaf midrib (107 to 104) in 4 days. In HLB-affected citrus orchards over a period of two years, the CLas incidence was reduced to <3% and CLas copies declined from 109 to 104 g-1 of diseased leaf midribs in the endophyte L1-21 treated trees and the diseased trees recovered and fruited very robustly. Interestingly, application of endophyte B. subtilis L1-21 was found to regulate citrus metabolites such as lysine, xanthine and tyrosine in diseased plant and L-isoleucine, N-glycyl-L-leucine, and tyrosine in healthy plant. We point out that the red-fluorescent tagged (RFP) endophyte L1-21 shared same niche with CLas inside citrus phloem and could exclude pathogen by efficient colonization. Application of L1-21 activated plant defence through functional pathways and pathogen-resistance genes as well as regulated various important citrus metabolites involved in disease resistance. Moreover, Asian citrus psyllid (ACP) is the natural vector of CLas and L1-21 could also colonize inside ACP and reduced pathogen copies in diseased trees. Additionally, introduction of L1-21 restructured citrus microbiome by regulating key bacterial communities which might help plant to control this pathogen. We concluded that establishing a sustainable HLB control strategy through citrus endophytic microbiome restructuring using an indigenous endophyte might activate plant defence through functional pathways and pathogen-resistance genes.

Keywords
Citrus; Huanglongbing; Endophyte; Defense; Colonization

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