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Poly(sugar acids): Phenolic Derivative of Acidic Polysaccharide Poly(2,3-glyceric acid from Medicinal Plants of Boraginaceae family and its Therapeutic Efficacy

The Boraginaceae family comprises a group of plants that are important for medicine and pharmaceutics. However, these plants are also rich in hepatotoxic pyrrolizidine alkaloids. The high molecular (>1000 kDa) water-soluble preparations from medicinal plants of *Symphytum asperum, S.caucasicum, S.officinale S.grandiflorum, Anchusa italica, Cynoglossum officinale* and *Borago officinalis* (Boraginaceae) were investigated. The fractionation of aforenamed preparations by means of ultrafiltration on membrane filter with cut off value of 1000 kDa permitted completely remove toxic pyrrolizidine alkaloids. Consequently the use of above mentioned plants does not rise any objection. The main chemical constituent of high molecular preparations was found to be poly[oxy-1-carboxy-2-(3,4-dihydroxyphenyl)-ethylene] or poly[3-(3,4-dihydroxyphenyl)-glyceric acid] (PDPGA) according to data of liquid-state ^{1}H, ^{13}C NMR, 2D $^{1}H/^{13}C$ HSQC, 2D DOSY and solid-state ^{13}C NMR spectra. The polyoxyethylene chain is the backbone of this polymer molecule with a residue of 3-(3,4-dihydroxyphenyl)glyceric acid as the repeating unit. PDPGA as a 3,4-dihydroxyphenyl derivative of poly(2,3-glyceric acid ether) belongs to a class of an acidic polysaccharides [poly(sugar acids)]. Human Hyaluronidase (Hyal-1) degrades high molecular Hyaluronic acid into smaller fragments which have pro-inflammatory effects. PDPGA possessed the ability to inhibit the enzymatic activity of Hyal-1 completely. Consequently PDPGA exhibited anti-inflammatory efficacy. PDPGA exerted anticancer activity *in vitro* and *in vivo* against androgen-dependent and -independent human prostate cancer (PCA) cells via targeting androgen receptor, cell cycle arrest and apoptosis without any toxicity, together with a strong decrease in prostate specific antigen level in plasma. Thus, PDPGA was identified as a potent agent against PCA without any toxicity.

Biography

Dr. Vakhtang Barbakadze has his expertise in isolation and structure elucidation of biologically active plant polysaccharides and polyethers. In 1978 and 1999 he has completed his Ph.D and D.Sci., respectively. He is the Head of Department of Plant Biopolymers at the Tbilisi State Medical University Institute of Pharmacochemistry. In 1996 and 2002 he has been a visiting scientist at Utrecht University (The Netherlands) by University Scholarship and The Netherlands organization for scientific research (NWO) Scholarship Scientific Program, respectively. He has published more than 100 papers in reputed journals. In 2004 he was Georgian State Prize Winner in Science and Technology.

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Multi-Criteria Spatial Decision Support Systems for Urban Vulnerability Evaluation

The contribution aims at structuring a Spatial Decision Support System (SDSS) for vulnerability analysis of complex urban systems through multi-criteria procedures and multi-group methods within the Geographic Information System (GIS) environment. The heatwave hazard has been addressed focusing on the physical and social dimensions of vulnerability as a complex phenomenon requiring effective indicators which allow an adequate assessment in quantitative and qualitative terms. The different definitions of vulnerability and multiple impacts affecting the urban system led to developing two main models within a MCDA framework.

The knowledge model allowed analysing of the features of the examined system and, concurrently, structuring of indicators dataset as a proxy of the spatial criteria.

The evaluation model aims at a weighting of the normalized indicators with multi-criteria procedures and scoring them according to the preference of the experts.

The spatial assessment of homogeneous vulnerability classes aided in transforming spatial indicators' values into clusters of priority. The achieved outcome is twofold since it concerns mapping and clustering of geographical zones which are more exposed to heatwave hazard in order to improve the spatial decision-making. The SDSS has been tested to the urban system which includes the eastern neighbourhoods of Naples city, in Southern Italy.

Biography

Maria Cerreta has completed her PhD from University of Naples Federico II, Italy. She is professor of Environmental Assessment and Evaluation at the Department of Architecture (DiARC), University of Naples "Federico II", Italy, and the Coordinator of the Second Level Master in "Planning and Sustainable Design of the Port Areas" and the Director of the Advanced Course in "Real Estate Market and Urban Regeneration (MIRU)".

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Advanced Modeling and Simulation Platform for COVID-19 Airborne Transmission

In response to the emerging deadly coronavirus pandemic early March 2020, the Defence and Security Research Institute at the University of Nicosia (Cyprus) has been developing research and development activities to deepen our understanding of the COVID-19 airborne transmission. An advanced Modeling and Simulation Platform has been developed based on advanced Computational Fluid Dynamics techniques that take into account complex physical phenomena such as contaminated saliva droplets dynamics, virus concentration in saliva and the coronavirus viability concerning evaporation. The numerical platform includes Euler-Lagrange highly coupled techniques, including high fidelity heat and mass transfer models with droplet-droplet and droplet-fluid interactions solving.

Several studies have been conducted to quantify the influence of the environmental conditions (temperature, relative humidity, wind speed) on the 3D dynamics and evaporation process of expelled contaminated saliva droplets. The effect of coughing incidents on altering the face masks efficiency was also quantified. The numerical results were promising and helped the public to understand the importance of safe social distances better and face masks correct wearing, which are found to depend on the environmental conditions. The numerical platform developed is supported by another experimental platform as a new respiratory Laboratory System under development at the cutting edge of technology.

Biography

Professor Dimitris Drikakis is the Vice President for Global Partnerships and Executive Director, Research and Innovation at the University of Nicosia, Cyprus. He has a joint professor's appointment in the School of Sciences and Engineering, and Medical School. Prior to that, he held academic and executive posts as Professor, Executive Dean, and Head of Department at various UK universities over a period of 24 years; he has also held senior academic/research posts in Germany and France. His research is multidisciplinary and covers topics of engineering science and emerging technologies, including fluid mechanics, acoustics, materials, computational science and nanotechnologies with applications to aerospace, defence, energy and biomedical sector. He has received the William Penney Fellowship Award by the UK's Atomic Establishment in recognition of his contributions to multicomponent flows; and the Innovator of the Year Award (2014) by the UK's Innovation Institute for a new generation carbon capture nanotechnology device. He has co-authored two books and has published more than 420 papers in journals and conference proceedings. He has graduated 45 PhD students who now hold positions in academia and industries around the world.

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The Impact of using Flow Chemistry on Applied Catalysis

Microwave assisted reduction technique was developed to prepare active Pd/Fe_3O_4 nanoparticles as a highly efficient magnetic catalyst used for the catalytic oxidation of carbon monoxide. The method involves simultaneous reduction of the corresponding Pd $(NO_3)_2$ and Fe $(NO_3)_3.9H_2O$ under the microwave irradiation conditions using a flow reactor. Hydrazine hydrate was used as the reducing agent under flow reaction conditions. The Pd/Fe_3O_4 nanoparticles have shown to exhibit high catalytic activity for CO oxidation catalysis. The catalytic activity of these materials can be attributed to the high degree of dispersion and concentration ratio of the Pd nanoparticles deposited on the surface of magnetite (Fe_3O_4) with a small particle size of 5-8 nm due to the effective microwave assisted reduction method. These nanoparticles are further characterized by variety of spectroscopic techniques including X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), and transmission electron microscopy (TEM). The investigated catalysis data revealed that palladium supported on iron oxide catalyst showed remarkable high catalytic activity towards CO-oxidation.

Biography

Dr. Hany Elazab is a Professor and Program Director of the chemical engineering department at (BUE). He was awarded his Ph.D from (VCU) in USA. He participated in several research projects in Nanotechnology, Catalysis, and Micro Reactor Technology funded from (NSF) in USA. He has published several research contributions to international journals, proceedings and international conferences. He is also participating as a reviewer and editorial board member in several international journals in catalysis, nanotechnology, chemical engineering.

Andrea Ponzoni[1]

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Networks of 1D nanostructures: electrical properties of materials and devices

This work reviews the electrical transport in random networks composed of 1D nanostructures such as, for example, carbon nanotubes and inorganic nanowires. The goal is providing an overview of the importance of these materials for the development of future solid state devices, highlighting their potentialities, but also the technological challenges underlying their full exploitation.

Indeed, these materials offer the opportunity to finely control the properties of elementary nanostructures and realize macroscopic layers by means of cheap fabrication methods. Several papers reported their suitability for the development of a variety of devices, such as solar cells, transparent electrodes, gas- and bio-sensors, to name but a few.

On the other hand, to achieve the full control of these materials and their functionalities, it is necessary to unravel the complex interplay between the individual properties of the network building blocks, namely the elementary nanostructures and the nanostructure-nanostructure junctions, their spatial distribution, and the way in which their combination control the macroscopic functionalities of the network. Besides the promising results achieved so far, the understanding of these phenomena is still partial, hindering our capability to take full advantage of the underlying potentialities.

At first, the application of geometrical and percolation models to interpret experimental networks is introduced to show difficulties that may be encountered when dealing with real networks. Then, the discussion will be focused on gas sensors, comparing the effects of different network building blocks (nanowires/nanotubes vs spherical nanoparticles traditionally adopted in this field) on the functional performance of these devices.

Biography

Andrea Ponzoni (AP) got the PhD in Materials Engineering from the University of Brescia (Italy). Since Nov. 2011 he is member of the permanent staff of CNR as Research Scientist. His research activity is mainly about nanomaterials for gas sensing applications. AP coordinated the CNR unit in the FP7 SNOOPY project ‘Sniffer for concealed people discovery’ (2014-2016) and is currently the coordinator of the SCENT project ‘One dimensional, single-chain polymers for gas sensors through high-pressure technology’ within H2020-ATTRACT (2019-2020). AP is member of the editorial board of the MDPI-Chemosensors journal.

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Self-assembled Nanolattice, Quantum Size Effect and Thermoelectricity in Some Nanomaterials:

In line with the research in nanomaterials as one of the most important cornerstones of twenty-first century development, we demonstrated a range of interesting properties of nanoscale thermoelectric materials, oxides and metals covering nanolattice, quantum size effect (QSE), surface plasmon resonance (SPR), a-nd thermoelectricity in the last one and a half decade. Briefly, we revealed anomalous electrical transport, size-dependent thermopower, natural self-assembly, size-induced structural hcp-fcc phase transition at ~6.0 nm with the coexistence of these atomic lattices internally, QSE-induced exponential drop in heat capacity, and dielectric environment sensitivity of SPR, in Ni nanoparticles. In thermoelectricity, desirable for waste heat harvesting, we showed the enhanced thermoelectric properties in Cu-doped Bi_2S_3 nanorods, Ag-nanoinclusion-induced Ag_2S, Ag-doped CuS nanocomposites, and a figure of merit of 2.17 in nanocrystalline camphor-sulfonic-doped polyaniline. Some of these aspects shall be discussed in this talk.

Biography

Dr. Gunadhor S. Okram did his PhD from Indian Institute of Technology, Bombay (1995), India. He joined UGC-DAE Consortium for Scientific Research, Indore, MP, India in 2001 as Scientist D after working at several research institutes as postdoctoral fellow including NIMS, Tsukuba, Japan (1996-98) as an STA Fellow. He is now Scientist G, and has guided three PhDs, 6 MPhils, 4 M Techs, 55 MSc and 4 BSc project students, delivered over 70 national and international conference invited lectures, reviewed several reputed journal papers, published over 128 peer-reviewed (reputed) journal papers and 117 conference proceeding presentations with 1452 times citations.

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Synthesis Strategies and Photocatalytic Applications of Graphene / Graphite-like Amorphous Carbon Hybridized Metal Oxide Semiconductor Nanocomposites

In this century, the biggest challenge is to solve the problem of water pollution. Synthetic wastewaters from various dye industries including textile dyeing industry have posed a great threat to water environment. This problem could be mitigated by the use of photocatalysts under light illumination. M-any fundamental aspects must have to be addressed to make a photocatalyst economically viable towards industrial application. Several strategies have been adopted for making efficient metal oxide semiconductor (MOS) photocatalysts including doping with anions/cations, improving surface structure by hybridizing/coupling with metals/other MOS/carbonaceous nanomaterials (like graphene, graphite-like amorphous carbon) and improving surface area/porosity with reactive facets of photocatalysts.

Researchers are highly motivated to work upon a wide range of functional nanomaterials including graphene owing to their favorable physicochemical properties suitable for catalysis, energy storage and biomedical applications. Research on graphene and graphite-like amorphous carbon based nanomaterials is pioneer in the field of photocatalysis. The compounds of graphene can able to form various functional nanocomposites (NCs) with inorganics (like metals, metal oxides) and organics (e.g. epoxy resin, polyaniline).

In our group, we have developed graphene/graphite-like amorphous carbon hybridized inorganic/organic NCs such as ZnO-graphene hollow microspheres, europium incorporated ZnO-graphene nanocomposite, ZnO-graphene-polyaniline nanoflowers, etc. for different applications like photocatalytic, photo-electrocatalytic and biomedical applications. This talk will mainly focus on synthetic strategies and photocatalytic application of wonderful graphene hybridized NCs with special attention to graphene hybridized ZnO nanocomposites/in-situ generated graphite-like amorphous carbon hybridized hierarchically structured simonkolleite-nano $SnO_2$for remediation of organic dye contaminated water pollution.

Biography

Dr. Sunirmal Jana, Senior Principal Scientist (CSIR-CGCRI) & Professor (AcSIR) presently working at CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata, India graduated as MS in Chemistry in 1991 from University of Kalyani and PhD (Science) in 1998 from Jadavpur University, India. He joined as a Junior Scientist at CSIR-CGCRI in December 1997. Dr. Jana worked as an invited Visiting Scientists including Brain Pool Scientist at Korea Research Institute of Chemical Technology, South Korea. He is an Editor/Editorial Board Member of several peer reviewed functional thin films and nanomaterials related journals. Dr. Jana is also a Life Member of many academic/research organizations/societies. Presently, he has published about 75 SCI/peer reviewed research papers, more than 80 conference papers, 6 book chapters and 3 Indian patents.

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Laser Lithographic Sintering of Dielectric Structures with Functional Geometries for Electromagnetic Wave Modulation

Photonic crystals with periodic arrangement of dielectric constants can exhibit bandgaps in electromagnetic wave spectra. The special dielectric patterns have been fabricated successfully through additive manufacturing, design and evaluation. In our recent investigation, ultraviolet laser lithography was newly developed as a direct forming process of fine ceramic components with micro geometric patterns. In the additive manufacturing, two dimensional cross sections were created through dewaxing and sintering by UV laser drawing on spread resin paste including ceramic nanoparticles, and three dimensional composite models were sterically printed by layer laminations and interlayer joining. Alumina or titania particles of 300 nm in average diameter were dispersed in to photo sensitive liquid resins at 50 % in volume fraction. The resin paste was spread on a glass substrate at 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted at 10 μm in diameter and scanned on the surface. Irradiation power was increased to 1 W for enough solidification depth. The half wavelength of the incident ultraviolet ray should be comparable with the nanoparticles gaps in the resin paste, and electromagnetic field can be resonated and concentrated through Anderson localization. After the layer lamination, titania structures with about 99 % in volume fraction were successfully processed to electromagnetic devices for terahertz waves modulations.

Biography

Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics” for environmental improvements of “Geotechnology”, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Siew Xian Chin[1] and Chin Hua

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Carbon nanotubes filled graphene oxide aerogel as electrode for electro-Fenton oxidation

Graphene oxide (rGO) aerogel filled with carbon nanotubes (CNT) were prepared by a one-pot hydrothermal process without using a binder. The produced CNTs/rGO aerogel was used as cathode in electro-Fenton system for the decolouration of organic dye and palm oil mill effluent (POME). The addition of CNTs increased the surface area, pore volume and conductivity of the rGO aerogel, which further enhanced their performance as cathode towards the decolouration of MB and POME via electro-Fenton reaction. The effect of electro-Fenton reaction parameters conducted using the aerogel samples including, current, electrolyte concentrations and pH, were investigated accordingly. The CNTs/rGO aerogel electrode showed high stability and reusability for up to several treatment cycles for dye. Besides, the CNTs/rGO aerogel also showed good performance in treating POME with 69.8%, 47.6% and 58.1% of reduction in true colour, total organic carbon (TOC) and chemical oxygen demand (COD), respectively, via 60 minutes electro-Fenton reaction. The obtained results showed that the CNTs/rGO aerogels with high porosity and stability can be prepared using simple procedure without adding binder. This fully carbon-based aerogel can serve as effective cathode for decolouration of organic dye and effluent.

Biography

Siew Xian Chin is currently a Senior Lecturer in the GENIUS@Pintar National Gifted Centre, Universiti Kebangsaan Malaysia (UKM). she received my Ph.D. in 2015 in Materials Science (UKM, Malaysia). Her research interests include pretreatment of lignocellulosic biomass into higher value materials, solid catalyst synthesis, bio-adsorbents for wastewater treatment, nanomaterials, nanocellulose, etc. Siew Xian Chin current H-index is 9. she has received the Best Materials Science Student in Faculty of Science and Technology Book Award, UKM 39th convocation (2012), First Class Student Award by YayasanNegeri Sembilan (2012) and Visiting Doctoral Researcher di Chinese Academy of Science, China) (2014). Graduate on Time (GOT) award

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Altered tooth-sum spur gearing

Altered tooth-sum spur gearing is an important aspect in design of spur gears used in automotive as well as defense industries. This gearing is made to work by varying the number of teeth operating between a specified center distance. In this technical talk the effect of contact stresses, bending stresses, sliding velocity, power loss and mesh stiffness and its effects on altered tooth-sum gearing will be discussed in comparison with standard tooth-sum gearing. The future challenges of this altered tooth-sum gearing in case of helical gears will also be discussed along with spur gearing.

Biography

Dr. Sachidananda is currently an Associate professor at Manipal academy of higher education at school of Engineering and IT, Dubai. He is working in the education industry from past 20 years. He has completed his doctoral degree from Manipal institute of technology, Manipal India. He has published more than 45 papers in international journals and conferences. He has been invited and honored as session chair in international conferences at UAE. Have been awarded the best paper presentation award at ICMTSET conference held at Dubai and also best poster presentation award at Manipal University, India. His research interest are in the area of machine design, altered tooth-sum gearing, optimization using Taguchi and grey relation analysis, ANN and manufacturing processes.

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New route of engineering magnetoresistance

A new proposal is given to achieve high degree of magnetoresistance (MR) in a magnetic quantum device where two magnetic layers are separated by a non-magnetic (NM) quasiperiodic layer that acts as a spacer. The NM spacer is chosen in the form of wellknown Aubry-Andr´e or Harper (AAH) model which essentially gives the non-trivial features in MR due to its gaped spectrum and yields the opportunities of controlling MR selectively by tuning the AAH phase externally. We also explore the role of dephasing on magnetotransport to make the model more realistic. Finally, we illustrate the experimental possibilities of our proposed quantum system.

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