Linkin Science

Exploring & Connecting Science

Proceedings of

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Mission

Our mission is to bring the researchers on a common platform and provide opportunity for them to interact. This scientific networking helps for the betterment of science by exchanging the ideas in a broader way.

Vision

Magnifying Scientific Knowledge by Sharing the research and ideas. We believe in accelerating the possibilities of novel discoveries and enhancement in scientific research, by connecting scientific community for knowledge sharing.

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We schedule different Medical, Health Care, clinical and engineering conferences to establish divergent platforms for delegates and other scientific researchers. Each conference, summit or executive briefing is tailored to the sector, topic and audience need. Our event structure varies depending on issue and market requirements. Keynote presentations delivered to all works for some content, whilst other conferences feature multiple breakout sessions, panels, roundtables and variable formats.

A team of highly skilled committee members dwell upon the trending topics of research to create a conference theme which can be used to exhibit ideas and research works among the scientific group laying the path for scientific discoveries.

Linkin Science
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KEYNOTE FORUM

DAY 1

NANOTECHNOLOGY & CHEMISTRY SESSIONS

HYBRID MODE
(ONSITE & ONLINE)

October
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Netherlands

Stress-induced exacerbation of Alzheimer's disease brain pathology is thwarted by co-administration of nanowire cerebrolysin and monoclonal antibodies to amyloid beta peptide with serotonin 5-HT6 receptor antagonist SB-399885

Hari Shanker Sharma* and Aruna Sharma
Uppsala University, Sweden

Alzheimer's disease is one of the most devastating neurodegenerative diseases affecting mankind worldwide with advancing age mainly above 65 years and above causing great misery in life [1-3]. About more than 7 million are affected with Alzheimer's disease in America in 2023 resulting in a huge burden on the healthcare system and caregivers and support for the family. However, no suitable therapeutic measures are available at the moment to enhance the quality of life for these patients. Development of Alzheimer's disease may reflect the stress burden of whole life inculcating the disease processes of these neurodegenerative disorders of the central nervous system. Thus, new strategies using nano delivery of suitable drug therapy including antibodies are needed in exploring neuroprotection in Alzheimer's disease brain pathology. In this chapter, the role of stress in exacerbating Alzheimer's disease brain pathology is explored and treatment strategies are examined using nanotechnology based on our own investigation. Our observations clearly show that restraint stress significantly exacerbates Alzheimer's disease brain pathology and nano delivery of a multimodal drug cerebrolysin together with monoclonal antibodies (mAb) to amyloid beta peptide (AβP) together with a serotonin 5-HT6 receptor antagonist SB399885 significantly thwarted Alzheimer's disease brain pathology exacerbated by restraint stress, not reported earlier. The possible mechanisms and future clinical significance are discussed.

Acknowledgments: This investigation is supported by grants from the Air Force Office of Scientific Research (EOARD, London, UK), and Air Force Material Command, USAF, under grant number FA8655-05-1-3065; Grants from the Alzheimer's Association (IIRG-09- 132087), the National Institutes Health (R01 AG028679).

Biography

Dr. Hari Shanker Sharma is Professor of Neurobiology (MRC) and Docent in Neuroanatomy (UU) at the Department of Surgical Sciences, Uppsala University Hospital (Sweden). He obtained his master's degree from Bihar University with special expertise in Cell Biology in 1976. Dr Sharma obtained his Doctor of Philosophy Degree (D.Phil.) in Neurosciences and was awarded his Ph. D in 1982 from Banaras Hindu University. After carrying out a series of Government of India-funded Research Projects on the Blood Brain Barrier (BBB) and brain dysfunction, Dr Sharma joined the lab of Neuropathology at Uppsala University, with Professor Yngve Olsson, to investigate passage of tracer transport across the BBB, caused by stress to the brain and spinal cord. In 1991, Dr Sharma was awarded the prestigious Alexander von Humboldt Foundation Fellowship of German Government for his work on hyperthermia-induced BBB dysfunction at the ultrastructural level in the laboratory of Professor Jorge Cervós-Navarro. Currently, his main research interest is Neuroprotection and Neurodegeneration in relation to the BBB in stress, trauma, and drugs of abuse in health and disease. Dr Sharma has published over 380 articles, 12 monographs and 70 international book chapters, and he has edited 15 book volumes.

Sleep deprivation enhances amyloid beta peptide, p-tau, and serotonin in the brain. Neuroprotective effects of nanowired delivery of cerebrolysin with monoclonal antibodies to amyloid beta peptide, p-tau, and serotonin

Aruna Sharma* and Hari Shanker Sharma
Uppsala University, Sweden

Sleep deprivation is quite frequent in the military during combat, intelligence gathering or peace keeping operations. [1-3]. Even one night of sleep deprivation leads to the accumulation of amyloid beta peptide burden that would lead to the precipitation of Alzheimer's disease over the years. Thus, efforts are needed to slow down or neutralize the accumulation of amyloid beta peptide (AβP) and associated Alzheimer's disease brain pathology including phosphorylated tau (p-tau) within the brain fluid environment. Sleep deprivation also alters serotonin (5-hydroxytryptamine) metabolism in the brain microenvironment and impairs the upregulation of several neurotrophic factors. Thus, blockade or neutralization of AβP, p-tau and serotonin in sleep deprivation may attenuate brain pathology. In this investigation, this hypothesis is examined using nano delivery of cerebrolysin- a balanced composition of several neurotrophic factors and active peptide fragments together with monoclonal antibodies against AβP, p-tau, and serotonin (5-hydroxytryptamine, 5-HT). Our observations suggest that sleep deprivation-induced pathophysiology is significantly reduced following nano delivery of cerebrolysin together with monoclonal antibodies to AβP, p-tau and 5-HT, not reported earlier.

Acknowledgments: This investigation is supported by grants from the Air Force Office of Scientific Research (EOARD, London, UK), and Air Force Material Command, USAF, under grant number FA8655-05-1-3065; Grants from the Alzheimer's Association (IIRG-09- 132087), the National Institutes of Health (R01 AG028679).

Biography

Aruna Sharma, MD is currently Secretary of Research at Uppsala University Hospital, Uppsala University, Sweden. She obtained her Bachelor of Science in 1971 and trained in Indian Medicine up to 1977 and engaged in medical research from 1978 to 1986 in India on hyperthermia induced brain dysfunction in the lab of Hari Sharma and Prasanta Kumar Dey under University Grants Commission and Indian Council of Medical Research Programs. She is a qualified experimental Neurpathologist and received her training at Karl Marx University Leipzig, Institute of Neurobiology (1987-1988); Semmelweis University Medical School, Department of Human Morphology and Developmental Biology, Budapest, Hungary (1988-1989), Free University Berlin, Germany (1989-1991) and Neuropathology Institute Uppsala (1992-1995). Dr Sharma is member of various Distinguished American Organizations and elected to receive the prestigious award "Women of the Years Representing Sweden Award 2009" for her outstanding contributions towards society by American Biographical Research Institute, USA; and "Best Professional Businesswomen Award 2010" For Setting Standard to Motivate, Excel and Inspire Others, Raleigh, North Carolina, USA. She has published over 50 original research papers in Reputed Neuroscience Journals and is currently Acquisition Editor of American Journal of Neuroprotection and Neurodegeneration. Aruna Sharma, MD is currently Secretary of Research at Uppsala University Hospital, Uppsala University, Sweden. She obtained her Bachelor of Science in 1971 and trained in Indian Medicine up to 1977 and engaged in medical research from 1978 to 1986 in India on hyperthermia induced brain dysfunction in the lab of Hari Sharma and Prasanta Kumar Dey under University Grants Commission and Indian Council of Medical Research Programs. She is a qualified experimental Neurpathologist and received her training at Karl Marx University Leipzig, Institute of Neurobiology (1987-1988); Semmelweis University Medical School, Department of Human Morphology and Developmental Biology, Budapest, Hungary (1988-1989), Free University Berlin, Germany (1989-1991) and Neuropathology Institute Uppsala (1992-1995). Dr Sharma is member of various Distinguished American Organizations and elected to receive the prestigious award "Women of the Years Representing Sweden Award 2009" for her outstanding contributions towards society by American Biographical Research Institute, USA; and "Best Professional Business Women Award 2010" For Setting Standard to Motivate, Excel and Inspire Others, Raleigh, North Carolina, USA. She has published over 50 original research papers in Reputed Neuroscience Journals and is currently Acquisition Editor of American Journal of Neuroproetction and Neuroregenartion.

The roles of HCO_3-/CO_3^{2-} in catalytic oxidation processes

Dan Meyerstein*
Ariel University, Israel, and Ben-Gurion University, Israel

Bicarbonate/carbonate ions are usually considered only as buffers and proton transfer agents. However recent results point out that they act also as co-catalysts in a variety of oxidation processes. This observation is due to the fact that the redox potential of the couple CO_3.-/CO_3^{2-}, 1.57 V, is considerably lower than that of the OH./H_2O suggesting that in many catalytic oxidation processes, carbonate might be involved. Furthermore carbonate ligands lower considerably the redox potential of transition metal cations. As a result, the carbonate ligand is a non-innocent ligand, i.e. a considerable charge transfer from the carbonate to the central cation occurs. The bicarbonate catalysis of the oxidation $Fe(H_2O)6^{2+}$ by di-oxygen will be presented including its geochemical and biological implications. The role of bicarbonate/carbonate in catalyzing the Fenton and Fenton-like reactions will be presented. The data points out that in these systems carbonate radical anions are the active oxidizing intermediates formed. The homogeneous and heterogeneous electro-catalytic water oxidation in the presence of first-row transition metal carbonates will be presented. The heterogeneous electro-oxidation of methanol and ammonia in the presence of first-row transition metal carbonates will be presented. The data obtained in these studies points out that the presence of bi-carbonate/carbonate in the system, they are always present in the environment and in living systems, has to be analysed in detail.

Biography

Meyerstein was born in Jerusalem in Mandatory Palestine. He earned a M.Sc. from The Hebrew University of Jerusalem in Physical Chemistry (1961), and a Ph.D. in Chemistry from the school as well (1965).Meyerstein is Professor Emeritus of Ben-Gurion University of the Negev a member of the Academia Europaea, the American Chemical Society, and the Royal Society of Chemistry.In 2004, Meyerstein opened the third annual David Bar-Illan Conference on the Media. Concerning the demographics of Israel, Meyerstein has stated that the birthrate in the Judea and Samaria District is “crazily higher than the rest of Israel.

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ORAL | DAY 1

5TH EDITION OF ADVANCEMENTS IN LASERS, OPTICS & PHOTONICS

HYBRID MODE
(ONSITE & ONLINE)

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Inferring dendritic and cortical neuronal assemblies during visual learning revealed with 3D random access microscopy

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Neural circuits in the visual cortex support rapid visual learning. However, due to technical roadblocks, it remains unknown how visual circuits represent multiple visual features of an environment during learning and how behaviorally relevant representations are selected for long-term memory. Here we developed Moculus, a head-mounted virtual reality platform for mice, which covers the entire visual field, allows binocular depth perception, and provides a fully immersive experience.
This highly naturalistic and controllable visual environment was combined with novel imaging and molecular biological technology. Namely fast acoustic-optical imaging combined with genetically encoded calcium or voltage indicator, where especially for the latter one, the kHz imaging rate is essentially for reliable response detection. These methods afforded rapid visual learning uncovering novel circuit substrates of fast visual learning.

We find that sparse cortical representations encode visual cues initially. Then response amplitude and spatiotemporal extent of both the control and reinforcement-associated visual cue-coding neuronal assemblies increase. Finally, assembly activity representing the reinforced cue and the corresponding behavioral outcome selectively increases, indicating competition between different representations. During this competition, reinforced and control cues are represented by partially orthogonal and overlapping spatial clusters of neurons centered around hub cells, which have higher response amplitude, earlier response onset time, and locally increased functional connectivity. Thus, visual circuits can rapidly extend cortical representations during learning to maximize computational capability and allow competition between different assemblies to encode behaviorally relevant information.

Biography

Gergely Szalay has been working at the Research Institute of Experimental Medicine (IEM) since 2008, with the main focus on in vivo, functional, two-photon imaging, targeting both corresponding technical development for improving the feasibility of these measurements (for example 3D imaging, motion correction) and the experimental paradigm (for example behavior system, labeling techniques). Lately, he has been exploring the therapeutic purposes of the technology in animal models. Shortly, they are projecting activity patterns associated with clues in a visual discrimination task to investigate to which extent behavior response can be regained in blind animals. Besides his main mission, Gergely has also been involved in some shorter which, for example, studies of calcium activity and cell death under occlusion, cell activity patterns and dendritic activity under share-wave, retinal degeneration studies using stimulated-Raman-scattering microscopy of live unlabeled tissue.

Lasing in Tin-based perovskites

Juan P. Martínez-Pastor
Instituto de Ciencia de Materiales, University of Valencia, Spain

Among metal halide perovskites, lead-free compounds are the most promising non-toxic alternative for developing different devices (micro-LEDs, micro-lasers, optical amplifiers, nonlinear optical modulators, photodetectors, etc.) integrated into the same chip. The most straightforward strategy is the use of Sn-perovskites, even if still suffers from very low stability and most of the synthesis, fabrication, and/or characterization work must be done under an inert atmosphere or vacuum. We have demonstrated efficient amplification of the spontaneous emission (ASE), which is achieved under a relatively low excitation fluence threshold (≈ 2 and ≈ 25 micro J/cm2 for 15 and 300 K, respectively) in backscattering geometry. When a thin film of FASnI3 is integrated forming optical waveguides (rigid: Si/SiO2/FASnI3/PMMA or flexible: PET/FASnI3/PMMA), this threshold can be further reduced by one order of magnitude, because of the strong electromagnetic field confinement and high gain of the active material. Moreover, ASE light is strongly polarized in the plane of the films, and it can be tuned (and even disappear) by bending the flexible PET substrate. Above the ASE threshold, we simultaneously observed a spectrally reproducible random lasing (RL) effect, which is characterized by a high mode stability and a very high-quality factor. The modes are spectrally reproducible and stable with time, which is a unique property of very thin FASnI3 films (200 nm thick) that can be due to the high efficiency of light scattering by grains of the film, as a result of the high refractive index of the material. Further advances have been achieved recently in FASnI3 films into DBR-based microcavities, within the framework of achievements in our European project DROP-IT (www.drop-it.eu).

This work was possible thanks to the DROP-IT consortium (H2020 FET-OPEN project under contract no. 862656) and the Spanish MCIN project PERIPHERAL (PID2020-120484RB-I00).

Biography

Juan P. Martínez-Pastor is a Full Professor and Director of the Institute of Materials Science at the University of Valencia (ICMUV). PhD in Physics, he has published more than 300 papers (from which 235 papers in JCR journals with >> 7000 citations). He has recognized experience & expertise (20 supervised PhDs, papers and research projects) in semiconductor physics (1986-), optical properties and exciton recombination dynamics of low-dimensional semiconductors (1990-), single quantum dot spectroscopy & single photon (2004-), optical sensors based on colloidal metal nanoparticles and quantum dots (2007-), active photonic waveguide structures (2010-), photodetectors based on quantum dots (2012-), 2D-semiconductors (2013-) and the most recent related to metal halide perovskites (2014-): optical properties, recombination dynamics, photonics and optoelectronics (including lead-free within the European project DROP-IT). He has been the PI of 10 national and several European projects, and coordinator of DROP-IT (DRop-on demand flexible Optoelectronics & Photovoltaics by means of Lead-Free halide perovskites, http://www.drop-it.eu). Head of the UMDO team, now formed by 6 laboratories + Theory (seven group leaders).

Generation of nonevanescent diffraction-less 2D beams with subwavelength widths in high-refraction-index media

S. V. Kukhlevsky*
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Non-diffracting light beams with subwavelength transverse dimensions are evanescent when propagating in free space. There are well-known linear solutions to the wave equations that predict the diffraction-less propagation of nonevanescent subwavelength beams in unbounded homogeneous linear media with high refractive indices. The present study describes a method for creating such beams by connecting a Fresnel-type (Fresnel waveguide) light source to the optical medium through which the beams are propagated. The parameters of the source and medium for producing two-dimensional (2D) beams with nanometre-scale widths are obtained through analytical and numerical analyses. The two models of the Fresnel waveguide source have been investigated. The Fresnel waveguide in the first model is a linear array of beams formed by the periodic lateral translation and phase change of a light beam launched from a metal slit (2D waveguide). In the second model, a phased array of metal 2D waveguides in contact with the optical medium simulates the Fresnel waveguide source.

Biography

Prof. S. V. Kukhlevsky received a CSc in Physics from the Hungarian Academy of Sciences (HAS) and a Ph.D. degree in Physics from the University of Pecs (UP), Hungary, in 1995. From 1993 to 1996, he was an Assistant Professor at the Department of Physics at UP. From 1997 to 2009, he was an Associate Professor with the Department of Physics at UP. He received a DSc in 2008 from HAS. From 2009 until now, he has been a Professor at the Department of Physics, UP. His research interests include nano-optics, nanophotonics, diffraction-less beam optics, plasma-based x-ray lasers and x-ray optics.

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ORAL DAY 1

NANOTECHNOLOGY & CHEMISTRY SESSIONS

HYBRID MODE
(ONSITE & ONLINE)

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Experimental measurements of the decay coefficient of a photonic metamaterial

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Acoustic wave propagation in metamaterials is a topic of great interest among the scientific community. For example, the pressure in a plane sound wave propagating in a viscous homogeneous fluid decays exponentially with distance and its decay coefficient depends on the fluid density ρ, the sound velocity c, and the two viscosity coefficients η and ξ. The decay length of sound in water at the frequency of 50 kHz is approximately 15 km. Therefore, viscous losses in the bulk can be neglected in the design of devices of sizes a few meters or centimeters. However, when a sound wave meets a solid boundary, a narrow viscous layer of thickness $\delta = (2\eta/(\omega\rho))1/2$ is formed. Velocity gradients within this viscous layer greatly exceed the gradients in the bulk, leading to higher viscous losses than in free fluid. Moreover, if the sound wave meets a set of solid boundaries, multiple reflections and viscous friction in narrow channels strongly increase energy losses. In some cases, viscous losses are desirable in devices that reduce external noise. Modern sound absorbers use innovative designs based on metamaterials. Artificial acoustic metamaterials can be used as structures to increase sound absorption to an extent not achieved in natural materials.

In this work, we present the experimental results for the decay coefficient of a sound wave propagating in a photonic crystal of solid cylinders embedded in a viscous fluid. Our experimental results show that the decay of the acoustic wave is 5-6 times larger than the decay of sound in a homogeneous medium. We observe that the decay of sound scales is the square root of frequency, unlike the square of frequency scaling known for free viscous fluid. By considering different asymmetric unit cells, we confirm our previous theoretical results that the photonic crystal behaves like a dissipative homogeneous meta-fluid with anisotropic viscosity.

Biography

J. Arriaga has been working in photonic and photonic crystals and metamaterials for the last 15 years, especially interested in problems of calculating effective parameters using the homogenization theory in the low-frequency limit. Previously he was working in the electronic structure of semiconductors and superlattices and in the field of the so-called photonic crystal fibers.

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KEYNOTE FORUM | DAY 1

FOOD SCIENCE & NUTRITION SESSIONS

HYBRID MODE
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Netherlands

Food and economy

Elvira Lo
U.S. Secretary of Commerce as Council Member for Hawaii Pacific Export Council, USA

Demand for food have been strong due to the surge in population growth in the world, as well as the demographic relocation and shifts. Based on statistical analysis, it's believed by 2050, emerging markets such as India, china, Indonesia, Philippines will take the lead in the growth of a middle class population with more disposable income. In order to feed the growing world population, prediction by the experts' report stated that agricultural production needs to grow by 70% by 2050 to facilitate such boom.

How is food related to economics? Food costs, price, and distribution are all factors which directly influence people's choices and quality of their life..

Because of such changes in population growth, consumption and urbanization shifts will lead to change in the supply and demand balance.

How's does the global financial situation affect the food supply chain in developed countries versus the emerging countries.

What causes the inflation? Demand and supply, higher demand of food will drive higher cost and sale price if supply is inconsistent or decrease due to war, weather factors, and fluctuation of currency exchange rate. We all know that the U.S. Federal Reserves have been raising interest rate since Mar 2022, which affect borrowing costs, lead to increase in production and labor costs, thus, companies put a pause on launching new business projects and expansion plans.

How many different types of inflation are there? And how does each type of inflation play its role in economy and agricultural commodities and food product demand.

Who favor inflation? How does it impacted on food supply and demand situation.

Biography

Ms. Elvira Lo was a graduate of University of Hawaii Manoa, since then she had created several businesses. She is responsible for the administration, management, leasing, as well as over looking the design, co-ordinate and development of extensive properties in Honolulu, U. S. mainland and overseas, both in commercial, industrial, single family houses and apartment buildings since 1985 to present. She currently is the president and CEO of her company and has been instrumental in overseeing the continuous growth and development. She has been selling her gourmet macadamia nut chocolate on Home Shopping Network nationally from 1997-2006 as well as markets her products locally, nationally and internationally.

Molecular Studies on the role of Copper, Zinc and Iron in ageing brain and related disorders

Jagannatha Rao KS[1]*, Emani LS[1], Vasuja Devi M[2] and Pavani A[3]

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[2]Electronics and Communication Engineering, KLEF Deemed to be University, India

[3]Department of English, KLEF Deemed to be University, India

Brain is an important organ for healthy living as it controls the body holistically. The role of nutrition in brain function plays a key role as brain is enriched with essential elements, omega-3-fatty acids, amino acids, lipid, proteins and essential vitamins like B12. The brain controlled functions like memory, cognition, movements etc are influenced by nutrients we eat. Any disturbance in nutrition patters alter the brain related functions leading to neurological/psychiatric disorders. Our lab has done excellent work on the levels of Cu, Zn, Fe in ageing brain and in Alzheimer's (AD) and Parkinson Disease (PD) brains and the biochemical consequences due to elevated levels of metals like oxidative stress through Fenton and redox reactions. Also these metals promote key pathological events like amyloid beta aggregation and we developed mathematical models to understand how metals cause aggregation leading to neurodegeneration. Our one of the argument is whether we can develop chelation therapy and we explained the clinical challenges associated with chelation therapy and also the possibility of using nutrients based chelation molecules like curcumin. We developed the models how curcumin able to chelate Cu, and Fe selectively from bound form to amyloid beta, ferritin and transferrin. The levels of Ferritin and transferrin are decreased in blood and brain there by favouring Cu and Fe to amyloid beta. These complex issues induce changes in DNA and induce strand breaks like single and double strand breaks and also block the DNA repair system. This imbalance favour the accumulation of double strand breaks leading to the cell death. The nutrients like curcumin play a key role in balancing these redox induced biochemical imbalances leading to neuroprotection. We strongly believe that neuro-nutrition also play key role in the maintenance of healthy ageing and also prevent brain disorders. To the best of our knowledge, this theory of neuro-nutrition is new and novel and has lot of clinical and preventive role in brain disorders.

For Young Scientist Award Presentation Millet-Based Designer Brain Foods for Healthy Aging

Lakshmi Sowmya Emani
Department of Biotechnology, KLEF Deemed to be University, India

Brain is a complex organ as 20% of brain is known and 80% is still complex to understand. Neuronal cell death plays an important role in neurological disorders. Currently 53 million are affected with neurological disorders and by 2050 the number reaches to 155 million. The mental health issues become a global burden now and in future. Hence. preventive model through Neuro nutrition is an essential need of the day. The brain needs essential nutrients such as Calcium, Iron, Zinc, Lipids, high quality of proteins, omega3-fattyacids, Potassium, Serotonin etc for health brain ageing. There are no evidenced based brain foods available in the market. Our concept is to develop evidenced millet-based designer ready-to-eat, freeze-dried brain foods for healthy aging and brain function for adolescent and geriatric population. Millets include cereals like sorghum, pearl, foxtail, little, kodo, finger, bamyard, which provides essential neuro nutrients. These foods are unique and reach to targeted populations. Neuro nutrition food will be more protective for brain health issues as currently, there are no drugs to increase memory and/or to decrease the anxiety, depression, and other psychological symptoms.

Studies on the role nutrition in Romantic Linguistics and Sexual Medicine: Current and future challenges

Pavani A[1*], Satyanarayana Rao TS[2], Emani LS[3], Vaduja Devi M[4] and Jagannatha Rao KS[3]

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Sex is an important event in healthy ageing and , sexual act is manipulated by multifaceted events like nutrition, language, feelings expression, good oxygenation, good nutrition, hormones etc. The understanding of sexual biology in human health is a current day need but also associated with future challenges. The sexual medicine has become full faculty in medicine engulfing linguistics, engineering medicine, neurosurgery, psychiatry, nutrition- all together a multidisciplinary model. Nutrition plays a key role in erotism and induces romantic feelings leading good health. Sexual act burn 260 calories in women and 275 calories in men and enhances high oxygen pattern from brain to other organs. Our studies indicated that ferritin, transferrin, Zn, Fe, Hb, Se, Spermine, VitB12, tryptophan etc serves as biomarkers in in good sexual health. These levels get altered in erectile dysfunction in man and dry vagina and inefficient sexual excitement in women. Nutrition components like, banana, garlic, drumsticks, pomegranate etc support good mental support and enhance feels through romantic language. The linguistics using specific words, poetic language, body beauty appreciation are key players during foreplay which induces the erotism leading organism with sexual act. VitB12, Se, Spermine etc support language centres in brain to express the feelings both in men and women. Most of the these components are from selective nutrition and good nutrition promotes good body microbiome which supports good body odours and support erotism. Recently, the changes in nutrition lead to sexual dysfunction, PCOD etc leading a challenge in sexual medicine. This lead to the discovery of tablets like Viagra, sexual toys, supplements, taped romantic language and pornography- all making sexual act mechanical posing challenges in health ageing. It is very important to incorporate the knowledge of healthy nutrition for healthy sex leading to good mental status finally to healthy ageing. Our experimental and theoretical knowledge adds new dimension to heathy life and ageing and avoid future health issues.

Infants fed either milk or artificial formula

R. Mandour
Mansoura University, Egypt

Background: Lead enters drinking water by leaching from pipes and solder joints in household plumbing. Aim of the work is to evaluate the lead pollution of potable water and its impact on blood lead levels of infants fed either milk or artificial formula.

Materials and methods: This study was done on ninety potable tap water samples collected from different districts and ninety blood samples taken from infants who attended in some of different hospitals. All samples were analyzed for lead by graphite furnace atomic absorption Spectrophotometer. The samples and standards were read to the same accuracy and at the same time.

Results: Mean lead level in groundwater showed higher level than in surface water. An elevation of blood lead level of bottle feeders using groundwater was noticed higher compared with that of their counterparts using surface water. Also, an elevation of blood lead level of breast feeders where mothers drink groundwater was noticed higher when compared with that of their counterparts born to mothers drinking surface water.

Conclusion: There was a positive relationship between blood lead levels and potable water lead levels. We concluded that bottle feeding was a strong predictor of elevated blood lead levels among infants.
Keywords; potable water; bottle and breast feeding; Blood.

Updated Health & Malnutrition status in the Gaza strip

Reham Mamdouh El Boji
Israa University, Palestine

Poor nutrition among children under the age of five years is the result of several interrelated poverty factors (UNOCHA MSNA, 2022):

- The high rates of unemployment (60.3% of Gaza households reported having at least one member of their household unable to find work)
- 81.0% of Gaza households reported challenges to being able afford their household's basic needs
- 50.5% reported relying on aid and assistance as their primary source of income.

These factors have led to a rise in cases of Acute malnutrition, and anaemia in children aged 6-59 months.

Throughout 2022, Ard El Insan (AEI) was able to reach 17137 children with malnutrition problems (AEI Annual Report, 2022). The report revealed that 8.29 % were children with Acute malnutrition and 70.63% were children with Anemia while they are also affected by over situation including poverty as result of increased unemployment, consequently affected the affordability of services.

Malnutrition is also strongly linked to recurrent infections such as gastroenteritis, respiratory tract infections and water borne- diseases. Water, hygiene conditions are vital to ensure that all health and nutrition interventions integrate key elements of water, sanitation and hygiene e.g., promotion of handwashing, provision of soap and latrines. Due to the increase in the level of poverty, many families cannot afford the cost of food nor basic needs including clean water and hygienic material, which increases the health risk exposure particularly among children.

Nutrient Intakes and Adequacy among preschooler children under blockade in Gaza City, Palestine

Samir Mohamed Abdulla Radi
Israa University, Gaza, Palestine

Background: After 16 years of blockade and closure, malnutrition has become a significant risk to the health of Gaza's youngest residents. According to recent national surveys, Palestinians are facing a double burden of malnutrition and very low levels of essential minerals and vitamins.

Aims: The aims of this study were to assess nutrient intake adequacy among preschool children and to estimate the dietary and nutrient intake deficiency in the Gaza Strip.

Methods: This cross-sectional, community-based, household survey was carried out in Gaza using 24-hour dietary recall to assess nutrient intake and adequacy among 176 children aged 2–5 years.

Results: Based on the nutrient deficiency for dietary intake [< 75% recommended dietary allowance (RDA)], energy shows the highest level of deficiency (89.8%) in the diet among the studied children followed by vitamin A intake (86.9%). About three quarters (73.3%) of the children studied consumed less than the RDA for calcium and 47.2% consumed less than the RDA for iron. Approximately 20% of the children consumed less than the RDA level of dietary intake for carbohydrate and 17% for zinc.

Conclusion: Nutrient intake among preschoolers in the Gaza Strip shows a dramatic deterioration in macro- and micronutrient deficiency, especially in rural areas. Although the findings in this study are in line with previous reports, it revealed greater deterioration than previous local studies.

Neuro Nutrition in relevance to Alzheimer's Disease: Theoretical modeling and meta data analysis

M. Vasuja Devi, Lakshmi Sowmya Emani, A Pavani, Jagannatha Rao KS
KLEF Deemed to be University, India

Alzheimer's Disease (AD) is a challenging disorder with complex etiology and pathology. Currently 55 million are affected by this disorder and by 2050, 155 million will be diagnosed. AD is only 5-8% genetically linked and 95% is sporadic in nature. There are biomarkers for the early detection of AD. Since it is progressive neurodegenerative disorder, the management of the disease is highly complex clinically. For the last 25 years, drug discovery for AD is complex and challenge and no successful drugs are available. AD is one of the challenging brain disorders with memory loss, cognitive failure, and depression etc. Neuro nutrition plays a key role in healthy aging and in the prevention of complex neurodegenerative diseases like AD. Our studies on trace elements, homeostasis in the brain, Cerebro Spinal Fluid (CSF) and blood have provided new dimension on the role of trace elements interaction and its co-interaction with amyloid aggregation. Our studies also evidenced aluminum contamination in food, high fat diet, low carotenoid rich foods contribute to the pathogenesis of the disease. We also developed novel curcumin derivates and carotenoids as neuro protective molecules modulating amyloid precursor processing pathway where these molecules block beta secretase there by decreasing amyloid beta load. These molecules also activate alpha secretase there by increasing SAPP alpha which protect the cell from neuronal cell death. Also, the molecules work through mitochondrial pathways and in the maintenance of genome integrity. Overall, the molecules protect the cell from neuro degeneration through omics approach, thus providing the molecular role of nutrition components in the prevention of AD. We developed new hypothetical model explaining the role of nutrition with evidence-based information for the slowing down neuronal cell death or even prevention of the onset of AD.

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KEYNOTE FORUM

DAY 2

5TH EDITION OF ADVANCEMENTS IN LASERS, OPTICS & PHOTONICS

HYBRID MODE
(ONSITE & ONLINE)

October
02-04 2023
Amsterdam,
Netherlands

Microbottle resonator for humidity sensing

M.Batumalay[1]*, H.A. Zain[2] and S.W. Harun[2]
INTI International University, Malaysia

Microbottle resonators are used for chemical and environmental sensing. The resonators' high-quality factor and good sensing performance render them crucial in modern photonics sensors. Relative humidity sensors are vital for control and safety in many areas. Pharmaceutical and agricultural manufacturing require precise relative humidity sensors to guarantee safety. Thus, developing modern relative humidity sensors can aid in these endeavors.

A microbottle resonator was built for relative humidity sensing in one of our recent works. The soften-and-compress method was used to prepare the resonator from regular fiber cables. The sensing element is then coated with agarose. Agarose is a hydrophilic material used for sensing relative humidity due to its refractive index change with relative humidity. The coating was prepared using a magnetic hot plate. The agarose coating was prepared in a 0.5% solution. Then, the coating was applied to the resonator and left to dry fully. The sensing structure was secured and left without abrupt movement throughout the experiment. The sensing element was coupled with tapered fiber. The tapering diameter was set to be 3 microns, and the tapering was conducted by flame brushing. The resonator was secured in contact with the tapered fiber at a right angle with 0 nm distance as recommended by our COMSOL simulation in prior works.

The agarose-coated micro bottle resonator showed an improved sensing response to relative humidity. The sensitivity of the coated structure was higher than the uncoated structure. The time and temperature response of the coated sensor also showed promising results with minimum power variations.

Biography

Dr. Malathy Batumalay is currently attached to INTI International University, Malaysia as an Associate Professor. She holds a PhD in Photonics Engineering from University Malaya, Malaysia. Her research work focuses on lasers, fiber optics, and fiber sensors. In her previous research, she transformed fiber optic into sensors that is able to detect changes in relative humidity and chemical solution. In order to further investigate the behavior and characteristics of fiber optics sensors and plasmonic sensors, she collaborates with University Malaya, University Teknikal Malaysia Melaka and Airlangga University, Indonesia. To date, she has successfully published high quality journals on the related field.

The next-generation specialty optical fibers for high-power fiber laser, amplifier and broadband sources

Mukul Chandra Paul*

Fiber Optics and Photonics Division, CSIR-Central Glass and Ceramic Research Institute, India

The term 'specialty' signifies some special features of optical fibers induced through modification of the waveguide design or material composition of the core and cladding glasses or type of fiber material with special functions other than conventional communication optical fibers. Nowadays specialty optical fiber-based high-power fiber lasers, amplifiers, and broad-band sources cover the major portion of the photonics devices that are used in our modern society. We cannot think of our human life environment without the contribution of various kinds of specialty optical fibers which are used in Modern communication systems, the medical field, the Defence sector, Cable TV, FTTH, the Automotive Industry, Smart Cities, etc.

My talk will be devoted to the development of multicomponent glass-based specialty optical fibers to be used as high-power fiber lasers, optical amplifiers and broad-band sources where the specialty fiber's optical preform made through MCVD process in combination with solution doping technique using a solution of a mixture of suitable precursors of various elements such as Al, Ce, Hf, B, Ca, Er & Yb followed by their material, optical and spectroscopic characterizations along with study of their lasing, amplification and broad-band characterizations.

Biography

Dr. Mukul Chandra Paul received the Ph.D. degree from Jadavpur University, Kolkata, India in 2003. Presently he is working as chief scientist at fiber optics and photonics division, central glass and ceramic research institute, Kolkata, India. He has authored over 250 scientific publications, 10 book chapters and holding seven US patents on fabrication of rare-earth doped fibers. He also edited 2 Books on Fiber Laser. He also made major scientific contributions through International collaborative research work with various countries such as Malaysia, China, Taiwan, UK, France, Russia, Vietnam, Portugal etc. He is a member of OSA, IEEE and life member of MRSI and Indian Ceramic Society. 4 Ph.D. and 7 M.Sc. research works were directed by him. His current research interests include various material composition based specialty optical fiber development for continuous wave and pulsed fiber lasers at ~1 and 1.5 microns, high power optical amplifiers, fiber based saturable absorber, Broad-band supercontinuum sources.

Novel optical surfaces in high energy laser system development: A case study

Rama Gopal V Sarepaka*
Optics & Allied Engg. Pvt. Ltd., India

Advanced Optical Instrumentation offers great advantages in multiple application domains to meet the desired near-theoretical performances in terms of sharp focus, high resolution, magnification, etc. while providing compact & lightweight optics with a smaller footprint. However, these performance specifications and system criteria come with incumbent challenges of optical design, surface fabrication and system assembly. These challenges compel designers to explore novel optical surfaces to design & perform, and system developers to extend their fabrication skills to deploy out-of-box approaches to generate the desired optical profiles within permitted tolerances.

Traditional optical systems primarily use plane and spherical profiles to meet the transfer of photonic energy from the object space into the image space effectively. In optimally designed optical systems, this energy transfer is limited only by the diffractive limits of the optical profiles deployed. But with the advent of systems delivering near-theoretical performances coupled with budgeted physical features (viz: volume, weight, footprint), the system developers have turned their attention towards deployment of non-spherical optical profiles and thereby started reaping the benefits of enhanced performance.

The use of Non-Spherical Optical profiles in optical systems has a historical perspective. However, in earlier times, the generation of the non-spherical profile (Schmidt plate, etc.) was purely (optician) skill-based. However, with the development of advanced surface generators coupled with state-of-art surface characterization equipment, the generation of non-spherical surfaces has become a process-based and protocol-controlled exercise with the necessary degree of determinism.

In this discussion, a detailed case study of the development of a Novel Optical System, using Super Gaussian (non-spherical) optical profiles for use in High-Power CO2 Laser applications is presented. This discussion also includes the fabrication-metrology aspects of the Super Gaussian Optical Surfaces by using Oxygen-free High-Conducting copper mirrors.

Biography

Prof. RamaGopal V Sarepaka is a President at R&D Ops & DTM, IR Optics (Optics & Allied Engg.Pvt.Ltd., Bengaluru, India). He served as a Professor and Chief Scientist at Academy of Scientific & Industrial Research (AcSIR - Govt.of India) and CSIR-CSIO, Chandigarh, India (Federally Funded R&D Lab - Govt.of India) respectively.

Computational Photonics: Current status and trends

Salah Obbaya*
Center for Photonics and Smart Materials at Zewail City of Science and Technology, Egypt

The last few decades have witnessed significant advances in the fabrication of technology of micro and nano-photonic devices. Therefore, it is of paramount importance to have trustworthy computational modelling techniques for the analysis, design and optimization of these devices. In this regard, this talk will introduce an overview of the existing computational modeling tools for analyzing photonic devices, in general, and highlighting their salient features and shortcomings. It is well known that "plasmonics" plays a vital role now in localizing the optical field beyond the diffraction limit and hence in integrated optics. Therefore, the talk will focus on plasmonics modeling issues and the failure of the classical electromagnetic solvers to accurately characterize the nano-plasmonic devices. Therefore, new accurate and stable beam propagation method will be introduced for analyzing plasmonics in the classical regime. The rigor of this approach is mainly because of relying on the finite elements method and the twice faster Blocked Schur algorithm which can exactly represent all the wide spectrum of radiation, evanescent, and surface modes produced by the strong discontinuity between metal and its surroundings. Moreover, in merging quantum plasmonic devices, it becomes essential to introduce "Quantum Corrected Model (QCM)" in order to accurately model these devices, and the basics of QCM will be also discussed.

Biography

Salah Obayya, Fellow of IEEE, OPTICA, APS, IOP, and many other internationally learned societies. He has gained an international distinctive reputation in the Development and Application of Computational Models for the Analysis, Design and Optimization of a wide range of Micro and Nano-Photonic devices that have may applications in Photovoltaic Solar Cells, ultra-high precision sensors, Optical Communication Systems, and Healthcare Systems, etc. He has published 324 journal papers and 277 conference papers cited 5997 times, and h-index= 41.

He has supervised more than 150 postgraduate students, and his research team has been generously supported by external funding from industry as well as research councils in the UK and Egypt.

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KEYNOTE FORUM | DAY 2

NANOTECHNOLOGY & CHEMISTRY SESSIONS

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Amsterdam,
Netherlands

Mathematical modeling nano cargo biodistribution in solid tumors: The core-shell approach

Paulo C. DE Morais[1,2*]
Catholic University of Brasília, Brazil
University of Brasília, Brazil

This talk will address the heterogeneous solid tumor tissue organization and examine how this condition can interfere with the passive delivery of nano cargo in breast cancer preclinical models. In vivo image techniques were used to follow the nano cargo biodistribution. It will be assumed that the tumor vascular organization depends upon the sub-tumoral localization, and this heterogeneous organization promotes a nano cargo biodistribution preference toward the highly vascular peripherical region, in contrast to the inhibited vascular architecture in the tumor core region. Using imaging techniques, the assessed nano cargo biodistribution is successfully described under a comprehensive mathematical model. The proposed mathematical model was used to describe the differential biodistribution for two different breast cancer models. The mathematical approach herein described can be easily extended to describe different types of solid tumors in animal models.

Biography

Professor Paulo César De Morais, Ph.D., was a full Professor of Physics at the University of Brasilia (UnB) – Brazil up to 2013, Appointed as UnB's Emeritus Professor (2014); Visiting Professor at the Huazhong University of Science and Technology (HUST) – China (2012-2015); Distinguished Professor at the Anhui University (AHU) – China (2016-2019); Full Professor at Catholic University of Brasília (CUB) – Brazil (2018); CNPq-1A Research Fellow since 2010; 2007 Master Research Prize from UnB. He held a two-year (1987-1988) post-doc position with Bell Communications Research, New Jersey – USA, and received his Doctoral degree in Solid State Physics (1986) from the Federal University of Minas Gerais (UFMG) – Brazil. With more than 12,000 citations, he has published about 500 papers (Web of Science) and more than 15 patents.

In vitro blood-brain barrier model for drug brain permeability testing

Mònica Mir

[1]Institute for Bioengineering of Catalonia (IBEC), Barcelona Institute of Science and Technology (BIST), Spain

[2]Networking Biomedical Research Center in Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN), Spain

[3]University of Barcelona, Spain

Neurodegenerative diseases (NDDs) represent a major threat to the health of the population. Unfortunately, drugs intended to target the central nervous system (CNS) have much higher failure rates than non-CNS drugs. The main reason is the brain protection by the blood-brain barrier (BBB), one of the most extents and restrictive barriers in the body. In recent years, several promising therapies for NDDs were developed. However, in vivo, assays are expensive, time-consuming, and ethically questionable, and species-to-species variations in the expression profiles could lead to the inadequate reproduction of the human pathophysiology, which hinders the progression of these new alternatives. Hence, it became necessary to look for inexpensive and animal-free alternatives. Organ-on-a-chip (OoC) is an emerging alternative due to its versatile design and lower cost, that can use cells from human sources, to mimic in vivo physiological and pathological conditions. Recently, several devices have been developed to mimic biological barriers in the brain for the study of drug permeability. In addition, detection platforms such as electrodes can be included in OoC to monitor features as the proper development of the BBB. In this work, we present the development of a BBB-oC model with monitoring integrated into a co-culture of human endothelial cells in close interaction with human astrocytes and pericytes cells. The BBB-oC cells were characterized by optical images and live/dead assays. The proper BBB development also was evaluated by immunofluorescence of tight junction proteins (ZO-1 and cadherins) and with sensors. Finally, BBB performance was assayed with nanoparticles functionalized with peptides for amyloid disaggregation.

Biography

Dr. Mònica Mir graduated in chemistry in 1998, and in 2006, she obtained her doctorate in biotechnology. She carried out a postdoctoral at Max Planck Institute. In 2008, she joined the Institute of Bioengineering of Catalonia as a senior researcher while teaching as an Associate Professor at the University of Barcelona.

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ORAL | DAY 2

5TH EDITION OF ADVANCEMENTS IN LASERS, OPTICS & PHOTONICS

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Integrating Raman Spectroscopy, Machine Learning, and Advanced Data Preprocessing techniques for Chinese Handmade Paper Classification and Identification

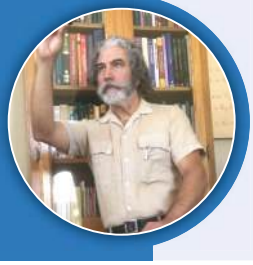
Chunsheng Yan[1,2*]

[1]State Key Laboratory of Modern Optical Instrumentation, China
[2]Zhejiang University Library, China

We have developed a 3D asynchronous correlation method (3D-ACM) for the classification and identification of Chinese handmade paper samples using machine learning on Raman spectra. The original spectral data is represented by a matrix M with dimensions w × s, where w represents the number of frequency points in the Raman spectra, and s represents the number of samples. Firstly, we employ a 2D asynchronous correlation method (2D-ACM) by performing a tensor product between each row and the Hilbert transform of another row within each category of M. This operation generates a new spectral data matrix, M', with dimensions w' × s', similar to M. Subsequently, we utilize the 3D-ACM by taking another tensor product between a row of M and the Hilbert transform of a row of M', resulting in a final matrix, M", with dimensions w" × s", for machine learning purposes. We employed six machine learning models: principal component analysis (PCA) combined with linear regression (LR), support vector machine (SVM) combined with LR, k-Nearest Neighbors (KNN), random forest (RF), and convolutional neutral network (CNN). The R-squared values of PLS-LR, KNN, RF and CNN supervised models, when applied to the 3D-ACM preprocessed data, approached or equaled 1, indicating high performance similar to unsupervised models like PCA. The 3D-ACM is a purely mathematical technique that is not limited to specific data types. It significantly enhances the equivalent frequency points (w") or spectral resolution, as well as the number of samples (s"), thereby leading to remarkable improvements in machine learning results.

Biography

Chunsheng Yan attained his bachelor's and master's degrees in optoelectronics from the University of Electronic Science and Technology of China (UESTC) in 1994 and 1999, respectively. He completed his PhD in Physical Electronics from the Department of Electronic Engineering at Tsinghua University, China, in 2003. From 2003 to 2005, he served as a postdoctoral researcher at Tsinghua University, and during 2006-2007, he worked as a visiting scholar at the Royal Institute of Technology in Sweden. From 2005 to 2018, Chunsheng Yan held the position of associate professor at the College of Optical Science and Engineering, Zhejiang University. Since 2019, he has been stationed at the Zhejiang University library, focusing on research related to paper cultural relics through spectroscopy. His primary area of interest lies in spectroscopy and spectrometry. He has authored over 10 papers in SCI-indexed journals, where he has served as both the first author and corresponding author.



Coherent sources for quantum entanglement

F. J. Duarte*
Interferometric Optics, USA

Albeit sources for quantum entanglement experiments are overwhelmingly known as sources of single photon pairs other emission alternatives are available. The focus on single photon pairs most likely follows from Dirac's pair theory (1930) in which an electron-positron pair undergoes annihilation to produce two gamma ray photons propagating in opposite directions. Dirac's pair theory was explained in workable terms by Wheeler (1946) who provided the first description of polarization entanglement of quanta propagating in opposite directions. Indeed, that was the very description utilized by Pryce and Ward (1947) to configure the very first quantum entanglement experiment and to correctly calculate, via Dirac's notation, the correct quantum probability of polarization entanglement. That experimental configuration was then applied by researchers such as Wu and Zhaknov (1950) to report on the first quantum entanglement polarization measurements. Optical versions of these experiments utilized Kr ion lasers and dye lasers to excite calcium transitions (Aspect et al, 1981). However, since the late 1980s, parametric down-conversion has largely dominated as a source of quanta pairs for entanglement experiments.

A second look at laser sources: quantum mechanics allows for the emission of correlated ensembles of indistinguishable photons as described in the second edition of Fundamentals of Quantum Entanglement (2022). In other words, one can have an entanglement of ensembles of indistinguishable photons and not just the entanglement of photon pairs. This allows for the development of highly coherent sources emitting ensembles of entangled indistinguishable photons in different directions as described by Duarte (2018). Quantum randomness of the emission is achieved by the use of intracavity polarizers controlled by a binary quantum random number generator. In this presentation, the physics of the emission of correlated ensembles of indistinguishable photons is described, via Dirac's identities. Also, the optical configuration of a workable prototype is discussed in detail. The principal advantage of such coherent sources is vastly superior signal-to-noise levels.

Biography

F. J. Duarte is a laser physicist, quantum physicist, inventor, and author resident in the USA. He is the author and editor of some 16 books, his solo titles include Tunable Laser Optics (2003, 2015), Quantum Optics for Engineers (2014), and Fundamentals of Quantum Entanglement (2019, 2022). Duarte's contributions have been applied in numerous fields from astronomy... to the philosophy of quantum mechanics. He is a Fellow of the Australian Institute of Physics (1987) and an Optica Fellow (1993).

Characterization of birefringence with elliptic eigenmodes in a wave biplate composed of two quarter-wave plate

Jhon Pabón*, Cristian Cely, and Rafael Torres
Universidad industrial de Santander, Colombia

Characterizing the transformation of polarization states as they pass through materials offers the opportunity to control and manipulate the polarization of light. Allowing the development of various applications. These properties that modulate the polarization present a characteristic behavior on the Poincaré sphere. As in the case of passing a polarized state in a birefringent medium, rotating said medium generates a characteristic curve, and it varies depending on the eigenmodes and the phase delay of the birefringent medium. Being the case of a birefringent with rotating linear eigenmodes previously geometrically characterized as the curve generated by the cut between a cone that intersects the Poincaré sphere, the angle of the cone being the birefringence of the material, this is the law of birefringence with linear eigenmodes.

On the other hand, when several birefringent wave plates (Composite Waveplate) with linear eigenmodes are superimposed, it varies their eigenmodes. These CWs have been characterized as birefringent with elliptic eigenmodes, however, their characteristic behavior on the Poincaré sphere is unknown. Therefore, in this work, we presented a theoretical-experimental characterization of the state curve generated by passing a polarized beam through a rotating wave biplate generated by two QWPs.

Using this curve, the biplate was characterized as a variable elliptical birefringent with eigenmodes and modulating birefringence in terms of the difference angle between its fast axes. In addition, it was found that its curve can be described by a rotated vertex cone, due to the action of additional rotary power, in this way the birefringence of different eigenmodes was characterized under the same geometric law, being their equations consistent with describing linear birefringence as a particular case of elliptic birefringence. Achieving a general geometric description of the birefringent media on the Poincaré sphere.

Biography

Physicist, focused on experimental physics in the field of Optics, with emphasis on the field of polarized light. Currently, I am a master's student in applied mathematics, interested in the study of polarization transformations caused by birefringent media, in the formalisms of geometric algebras; of quaternions and Pauli vectors. With knowledge of data science using Python.

Laser-assisted materials processing from the melt

Andreeta M.R.B.*, Oliveira R. B., Neme M. D., and Almeida N. P.
Federal University of São Carlos, Brazil

Photonic heating is increasingly gaining importance in materials preparation due to the possibility of creating high-temperature gradients, high heating and cooling rates and localized heating, which is virtually impossible with conventional resistive or inductive heating techniques. In materials engineering, laser-heated techniques have emerged due to the incessant search for energy efficiency and the reduction of costs in the preparation of new and conventional compounds and devices. Three main techniques that stand out for preparing compounds from the melt are Laser-Heated Pedestal Growth (LHPG), aerodynamic levitation and surface heat treatment. The LHPG technique has been used to prepare a wide variety of oxide compounds (poly or single crystal form), in a conventional optical fiber shape. Its main feature, the steep temperature gradients at the solidliquid interface (103 -104 K/cm), also creates the conditions to grow single crystals from incongruently melting compounds, using stoichiometric sources. The aerodynamic levitation technique is a very important tool for the field of oxide glass and glass-ceramics materials. This technique can be used to prepare almost any glass oxide composition due to its high cooling rates and sample sizes (in the order of 103 K/s and millimeter range, respectively). Since these techniques are crucibleless, there is also virtually no limit to reaching the liquidus temperature, expanding the range for materials exploration, which is usually determined by the crucible´s melting point. The last technique, surface heat treatment, besides its high heating and cooling rates, also enables very localized heating, which is very interesting for glass and glass-ceramics materials processing. In this work, it will be presented an overview of the three techniques and a discussion based on their thermodynamics and kinetic features. Optical and structural characterizations of several oxide compounds produced from these techniques will be presented and discussed, including Bi12TiO20, LiNbO3, La0.56Li0.33TiO3 and Li2O-CaO-SiO2 glass system. Among the technological possible applications, ultra-high temperature thermometry, medical devices and fuel cells will be discussed.

Biography

Marcello R B. Andreeta earned his PhD in Materials Science and Engineering in 2001 from the Physics Institute of São Carlos (IFSC), University of São Paulo (USP - Brazil), after experimental research collaboration with the University Autónoma de Madrid (Spain) and Stanford University (USA). His major field of research is the development of new strategies for the preparation of materials and devices by laser-heated process with more than 70 research papers published in the subject. His research interests include solid-state lasers, crystal growth, oxide glasses and solid-state sensors. Currently, he is developing new glass and crystalline compounds for optical and electric/electronic devices using the Laser-Heated Pedestal Growth and Aerodynamic
Levitation techniques at the Federal University of São Carlos (Materials Engineering Department - UFSCar/DEMa) in São Carlos, SP, Brazil.

Multi-layer polaronic non-dispersing trojan-like wavepackets on langmuir type-(2) click-clack balls trajectories in helium atom and quantum dots

Matt Kalinski*
Utah State University, USA

Some time ago we discovered that placing the Langmuir trajectories [1] of type one i.e., those in what we called the "Hoop Earrings" configuration in a combination of the symmetry augmented Circularly Polarized (C.P.) electromagnetic field and the magnetic field perpendicular to the planes of both electron parallel circular motions results in classical stabilization of the resulting Langmuir trajectories which therefore can support the stable non-dispersing quantum Trojan Wave Packets [2].

We have also recently shown that the Langmuir trajectories of type two i.e., those corresponding to the popular toy, the Click-Clack Balls when two electrons are moving in one plane on the semi-circular trajectories with the opposite angular velocity, bounce from each other, reverse the velocities and continue bouncing again and again also support such packets. To stabilize and confine the system further the perpendicular static magnetic field can be added in addition to the resonant L.P. field.

We have also found the nondispersive wave packets in the joined combination of the external L.P. field and the parallel static magnetic for the several electrons which planes of the semi-circular bouncing motion are symmetrically oriented with respect to each other under the multiples of the integer fraction of the full 360 degrees angle.

We use the generalized Gaussian Ansatz

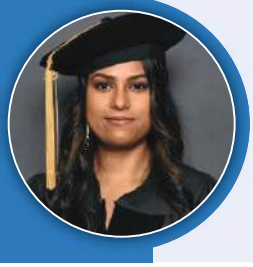
$$\psi = N \exp[-\sum \mathcal{M}_{ij}\tilde{x}_i\tilde{x}_j],$$

for the packet wave function and solve the equations for the localization matrix M(t) together with the classical equations of the motion.

Here we find that such trajectories and the corresponding Wave Packets are also possible in the more complicated multi-layer polaronic configuration when not one but several electrons each in a parallel layer are moving on each semi-circle and exchanging energy by the synchronized bouncing of each other in similarity to the one-dimensional solid crystal propagating phonons which here are the polarons.

Biography

Matt Kalinski (born 1968) is a US theoretical physicist who discovered Trojan wave packets, squeezed, coherent and intrinsically coordinate-entangled states of electrons in true atoms solving the long-standing problem of interstellar rocket propulsion by extending the positron or positronium lifetime and controlling the arbitrary slowdown of the recombination process of antimatter in a positronic rocket engine. Kalinski earned his Ph.D. in Physics from the University of Rochester. The broad applications of his discovery of coherent non-dispersing electrons and electron pairs in atoms and polar molecules are important and not limited to photonic superconductivity, laser centrifugal isotope separation of Deuterium, theory of cold nuclear fusion in Palladium, detection of ultra-weak magnetic fields with Aharonov-Bohm effect, direct observation of Berry phase in single atoms, arbitrary quantum state preparation, observation of Unruh-Davies effect as well as for the detection of possible gravito-electromagnetic force and twisted corrections to Einstein equations and precise engineering of complex quantum dot systems.



Time resolved electric field-induced second harmonic generation imaging from organic thin-film devices

Payal Bhattacharya*, Ping Yu, and Suchismita Guha
Department of Physics and Astronomy, University of Missouri, USA

Transient electric field-induced second harmonic generation (EFISHG) method, based on the third-order susceptibility, allows direct and selective probing of dynamic carrier motion in the active channel region of a field-effect transistor (FET). This technique provides a powerful tool for visualizing the carrier transport and predicting the carrier mobilities, free from contact resistance issues and device geometrical factors. We have developed a nonlinear microscopic imaging system using a tunable femtosecond laser and a pulse compensation arrangement, which compensates for any group velocity dispersion of the pulses in the imaging system. We apply the EFISHG technique to pentacene and other polymer-based FETs. By varying the time delay between the laser and the voltage pulse, the carrier motion across the FET channel is observed from which the carrier mobilities are deduced. This work was supported by National Science Foundation under Grant No. ECCS-1707588 and ECCS-182784.

Biography

Payal Bhattacharya was born in the city of Kolkata (erstwhile Calcutta), India and attended the University of Calcutta to receive a BS degree in Physics in 2014. Thereafter, she attended Banaras Hindu University and successfully graduated with a MS in Condensed Matter Physics in 2016. She worked as a research assistant at the Indian Institute of Cultivation of Science for a year before joining the University of Missouri – Columbia as graduate student in the Fall of 2017. In the Spring of 2018, she joined Dr. Suchi Guha's lab as a PhD candidate and specialized in nonlinear optical studies using ultrafast laser sources. Upon receiving her PhD, she joined MKS Instruments as a Senior Optical Thin Film Engineer and Laser Metrologist.

XRD and Raman experiments under extreme conditions of High Pressure (HP)

Raman Thiyagarajan*
Indian Institute of Technology Madras, India

Thanks to P. W. Bridgman, the Father of High-Pressure Research, Pressure is one of the fundamental thermodynamic variables, which affects both the volume of the cell and the local structure substantially. So, High-Pressure XRD and Raman Spectroscopy are two experimental non-destructive techniques that could be used to understand the behavior of materials under extreme pressure conditions resembling those deep within the Earth or in other extreme environments. It's important to note that both techniques require specialized equipment and expertise to carry out experiments at high pressures. In terms of facilities for generating HP, High-Pressure Cell and Support Equipment are basic requirements, particularly saying, that a cell with an optical window is only the way to carry out HP XRD and Raman experiments. Diamond anvil cells are especially popular for techniques like high-pressure X-ray diffraction and Raman spectroscopy. In terms of experiments under HP, Optical and X-ray Systems with high energy are essential for example synchrotron X-ray sources provide intense, tuneable X-ray beams. Here, calibrating that particular pressure cell/device to realize the exact pressure on the sample is the crucial step. In this talk, let me to discuss the method of HP generation and the calibration using DAC suitable for XRD and Raman experiments and some of my interesting results.

Biography

R. Thiyagarajan graduated Ph.D. in physics from Bharathidasan University, Trichy in 2014 and completed two Post-Doctoral Positions: (i) High-Pressure Science and Technology Advanced Research (HPSTAR), Shanghai, China, and (ii) Technical University of Dresden (TUD), Dresden, Germany. Currently, he is working as a Research Scientist at the Indian Institute of Technology Madras, Chennai. Briefly to say, he has adequate experience in High-Pressure experiments with different kinds of high-pressure cells for various measurements (XRD at worldwide synchrotron facilities, Raman, electrical resistivity, and magnetization). It has resulted in 37 peer-reviewed publications (140 impact factors) including 20 numbers of Q1 publications and 10 numbers of Q2 publications.

Harnessing light for food security

Shilpi Agarwal*
Optics and Photonics Laboratory, School of Physical Sciences, Jawaharlal Nehru University, India

We live in a world bathed in light. Light influences our lives today in new ways that we could never have imagined just a few decades ago. As we move into the next century, light will play an even more significant role, enabling a revolution in world fiber-optic communications, information technology, health care and life science, national defence, manufacturing and much more. One of the most challenging concerns of the 21st century is ensuring food security for the world's rapidly growing population. Motivated by food insecurity arising from a growing global population and climate change, Precision Agriculture has been proposed as a strategy to increase agriculture productivity while enhancing sustainability. In recent years, there has been growing interest in Raman spectroscopy as a high-content phenotyping tool for Precision Agriculture. Raman spectroscopy is one such photonic technique that is based on the inelastic scattering of light. It measures the molecular vibrations in a compound and its Raman spectrum can act as a fingerprint. This technique has high specificity. One of the main advantages of Raman spectroscopy is that a single spectrum can reveal information about multiple analytes. Concomitantly, Raman spectroscopy has been currently established to noninvasively determine the physiological status of a plant and hence Raman spectroscopy can offer widespread food safety assessment in a non-destructive, ease-to-operate, sensitive, and rapid manner. In this talk we will discuss the design and development of a portable Raman sensor for food security.

Biography

Dr. Shilpi Agarwal has been an Assistant Professor at the School of Physical Sciences, Jawaharlal Nehru University New Delhi since 2020. She has a Master of Science degree in Physics from A. P. S. University and a Ph.D. in Optical Engineering from the Indian Institute of Technology Delhi. She got the Best Thesis Award in the field of Optical Instrumentation from the Instrument Society of India (ISOI), Indian Institute of Science (IISc) Bangalore in 2018. She did her postdoctoral research at Singapore MIT Alliance for Research and Technology (SMART), Singapore. Her research interests include Bio-Medical Optics, Quantitative Microscopy, Optical Metrology, Talbot Interferometry, Digital Holography, Raman Spectroscopy, and Optical instrumentation.

New Liquid Crystal Display and Photonics Devices based on photoalignment

Vladimir G. Chigrinov*

Hong Kong University of Science and Technology, Hong Kong Nanjing Jingcui Optical Technology Co., LTD, China

Photoalignment and photopatterning have been proposed and studied for a long time [1]. Light is responsible for the delivery of energy as well as phase and polarization information to materials systems. It was shown that photoalignment of liquid crystals by azodye nanolayers could provide high-quality alignment of molecules in a liquid crystal (LC) cell. Over the past years, a lot of improvements and variations of the photoalignment and photopatterning technology has been made for photonics applications. In particular, the application of this technology to active optical elements in optical signal processing and communications is currently a hot topic in photonics research [2]. Sensors of external electric field, pressure and water, and air velocity based on liquid crystal photonics devices can be very helpful for the indicators of climate change.

We will demonstrate a physical model of photoalignment and photopatterning based on rotational diffusion in solid azodye nanolayers. We will also highlight the new applications of photoalignment and photopatterning in display and photonics such as: (i) fast high-resolution LC display devices, such as field sequential color ferroelectric LCD; (ii) LC sensors; (iii) LC lenses; (iv) LC E-paper devices, including electrically and optically rewritable LC E-paper; (v) photo-induced semiconductor quantum rods alignment for new LC display applications; (vi)100% polarizers based on photoalignment; (vii) LC smart windows based on photopatterned diffraction structures; (vii) LC antenna elements with a voltage controllable frequency.

Biography

Vladimir G. Chigrinov is Professor of Hong Kong University of Science and Technology since 1999. He is an Expert in Flat Panel Technology in Russia, recognized by the World Technology Evaluation Centre, 1994, and SID Fellow since 2008. He is an author of 6 books, 31 reviews and book chapters, about 317 journal papers, more than 668 Conference presentations, and 121 patents and patent applications including 36 US patents in the field of liquid crystals since 1974. He got Excellent Research Award of HKUST School of Engineering in 2012. He obtained Gold Medal and The Best Award in the Invention & Innovation Awards 2014 held at the Malaysia Technology Expo (MTE) 2014, which was hosted in Kuala Lumpur, Malaysia, on 20-22 Feb 2014. He is a Member of EU Academy of Sciences (EUAS) since July 2017. He got A Slottow Owaki Prize of SID in 2018. He is 2019 Distinguished Fellow of IETI (International Engineering and Technology Institute).

Since 2018 he works as Professor in the School of Physics and Optoelectronics Engineering in Foshan University, Foshan, China. 2020-2024 Vice President of Fellow of Institute of Data Science and Artificial Intelligence (IDSAI) Since 2021 distinguished Fellow of Institute of Data Science and Artificial Intelligence.

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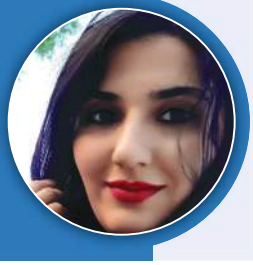

Enhancement of photocatalytic capability of g-C3N4 by heterojunction creation aiming H2 evolution via water splitting

Fatemeh Sousani*, S.Kh. Sadrnezhaad, P. Abachi, and H. Mahtabpour
Sharif University of Technology, Iran

This study aims to improve the visible light H2 evolution photocatalytic performance of graphitic carbon nitride (g-C3N4) by developing a ternary nano-photocatalyst consisting of NixCo1-x, ZnxCd1-xS (ZCS) and g-C3N4 (CN). We started investigating g-C3N4 and found it had low photocatalytic efficiency for H2 production. Concerned about the limitations, we introduced material Ni0.8Co0.2/Zn0.8Cd0.2S (ZCS) and achieved the desired final compound. Ni0.8Co0.2/Zn0.8Cd0.2S/g-C3N4 is synthesized through a straightforward combination of chemical reduction and hydrothermal techniques. The nano-photocatalyst's morphology, structural features, and photocatalytic properties are assessed using various characterization methods, including field emission scanning electron microscopy (FE-SEM), Brunauer–Emmett–Teller (BET) analysis, X-ray diffraction (XRD), UV-Vis diffuse reflectance spectroscopy (DRS), and photoluminescence (PL). The photocatalytic water splitting experiments were conducted under an LED lamp (100 W, 400 nm to 700 nm) irradiation for 4 hrs., respectively. Based on the test results, the H2 evolution rate of Ni0.8Co0.2/Zn0.8Cd0.2S/g-C3N4 reached 1980 µmol/g.h, which is 1980 times higher that of pristine g-C3N4. Moreover, the H2 evolution rate of Ni0.8Co0.2/Zn0.8Cd0.2S/g-C3N4 during the 16 hrs. cycle experiment did not significantly decrease, suggesting that Ni0.8Co0.2/Zn0.8Cd0.2S/g-C3N4 nano-photocatalyst exhibited durability. Accordingly, this ternary nano-photocatalyst possesses the ability to function as a promising photocatalytic substance to produce H2 under visible light. This study provides recommendations for the creation of innovative heterojunction catalysts that exhibit exceptional efficacy and sustainability.

Biography

Fatemeh Sousani joined the Sharif University of Technology as a doctoral student in the Department of Material Science and Engineering. The subject of her doctoral thesis is entitled "The Performance Improvement of H2 Production via Water Splitting with NixCo1-x/ZnxCd1−xS/g-C3N4 nanohybrid photocatalysts". The supervisors are Dr. Sayed Khatiboleslam Sadrnezhaad and Dr. Parvin Abachi. They work as a team in this field. She received her master's degree in 2017. She worked on the design of germanium–carbon antireflection coatings. She also had a research project to investigate the thermal stability properties of germanium-carbon coatings. The results of her master's works are published in reputable ISI journals and can be searched.

Evaluation of Tetrahydrocurcumin-Loaded Lipidic Nanoparticles Incorporated within Tacrolimus Ointment: In Vitro and In Vivo Assessment

Vandita Kakkar
University Institute of Pharmaceutical Sciences, Panjab University, India

Preclinical safety and proof of concept studies for a topical ointment comprising of concentrated tetrahydrocurcumin loaded lipidic nanoparticles (THC-LNs) and tacrolimus ointment (TTO) is proposed in the present investigation. The skin irritation potential and acute dermal toxicity were performed in rats in compliance with the Organization for Economic Cooperation and Development (OECD) guidelines (402, 404 and 410) while the cytotoxic potential was performed in HaCaT cells. Finally, in vivo evaluation was performed in Imiquimod mice model of psoriasis. In primary skin irritation assessment, TTO formulation, marketed formulation (Tacroz® Forte), THC-LNs, and blank LNs were topically applied on intact skin sites in rats while another group served as a negative control group for 72 h. TTO did not induce any adverse reactions. Repeated 28 days dermal toxicity followed by biochemical and histopathological assessment showed negligible alternations and skin lesions. THC-LNs revealed negligible cytotoxic potential in HaCaT cells. In vivo pharmacodynamic study performed on mice using Imiquimod induced psoriasis model, showed significantly high anti-psoriatic activity of TTO in comparison to marketed ointment. This was confirmed by evaluating the change in body weight, ear thickness and erythema, scaling, splenomegaly, Psoriasis Area and Severity Index (PASI) scoring, and histopathological investigation. Based on these findings, it can be ascertained that TTO showed minimal toxicity and has ample potential for further clinical analysis. Results represent an efficient and commercially viable alternative for psoriasis treatment with satisfactory potential. The combination of THC and tacrolimus had the antioxidant effects and the findings for this study can be further explored extensively to determine the mechanism of synergism of THC-LNs and tacrolimus for psoriasis.

Biography

Dr Vandita Kakkar is an Assistant Professor in the Department of Pharmaceutics, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh and has a research experience of more than 11 years. Her area of research lies in: Bioavailability enhancement of phytopharmaceuticals using nanoparticle technology via oral and topical routes; Scale up of the nanoparticle production from lab scale to pilot stage; Combatting antimicrobial resistance & developing targeted delivery systems for cancer treatment. She has to her credit >45 international/national research papers and review articles with h-index 19 and 2573 citations; 12 book chapters in international books; 32 magazine articles in ingredient south Asia and PharmaBiz and 5 national patent applications. She has been awarded around 10 million Research grants from UGC, Panjab University, BIRAC, DST, ICMR and commonwealth commission (UK). She has transferred the technology to Hi Tech formulation and is consulting a project of Cedrous Bio-product. She has industrial experience of 2 years. She has to her credit several awards and accreditations.

Monomethyl branched-chain fatty acids are critical for Caenorhabitis elegans survival in elevated glucose conditions

Andre F. C. Vieira*, Mark A. Xatse, Hamide Tifeki, Cédric Diot, Albertha J. M. Walhout, and Carissa Perez Olsen

Worcester Polytechnic Institute, USA

The maintenance of optimal membrane composition under basal and stress conditions is critical for the survival of an organism. High-glucose stress has been shown to perturb membrane properties by decreasing membrane fluidity, and the membrane sensor PAQR-2 is required to restore membrane integrity. However, the mechanisms required to respond to elevated dietary glucose are not fully established. In this study, we used a 13C stable isotope-enriched diet and mass spectrometry to better understand the impact of glucose on fatty acid dynamics in the membrane of *Caenorhabditis elegans*. We found a novel role for monomethyl branched-chain fatty acids (mmBCFAs) in mediating the ability of the nematodes to survive conditions of elevated dietary glucose. This requirement of mmBCFAs is unique to glucose stress and was not observed when the nematode was fed elevated dietary saturated fatty acid. In addition, when worms deficient in elo-5, the major biosynthesis enzyme of mmBCFAs, were fed *Bacillus subtilis* (a bacteria strain rich in mmBCFAs) in combination with high glucose, their survival rates were rescued to wild-type levels. Finally, the results suggest that mmBCFAs are part of the PAQR-2 signaling response during glucose stress. Taken together, we have identified a novel role for mmBCFAs in stress response in nematodes and have established these fatty acids as critical for adapting to elevated glucose.

Biography

Professor Andre Vieira is completed his Doctor of Philosophy (Ph.D.) in Worcester Polytechnic Institute (WPI) University and also work as a teacher assistant (TA) in the same place. He was completed his bachelor's degree in Biomedical Science (2011) and master's in Biotechnology (2015). The skills gained during his education and job experiences go from general analysis in pathology laboratories to proteomic and lipidomic analysis. Currently, he is working on evaluating the regulation of the phospholipid membrane under exogenous stress. Therefore, most of the data is generated using chromatography and mass spectrometry.

Application of artificial intelligence in plastics recycling

Suresh Kumar M S*
Department of Chemistry, Narasimha Reddy College of Engineering, India

Materials development made a better world and left the world with thrashes particularly plastics. The one-dimensional growth in developing new materials addressing new applications has posed three-dimensional challenges of pollution in land, water, and air. For more than a decade pollution by waste plastics has emerged as a big threat not only in urban areas but also affected the rural areas. More the urbanization more the waste generated. Additionally, micro-plastic detection in smaller living things alarmed the depth and breadth of plastic pollution in, around and everywhere.

Irrespective of developed, developing and under-developed countries plastics pollution has become a common challenge. As different types of plastics are combined invariably including wet/dry, electronic/regular, commodity/engineering, degradable/non-degradable, medical/non-medical, etc., complications are added in sorting, binning and recycling. As a result, most of the time, the waste is left unattended or burnt, which invites added challenges. Waste generation, having exponential growth with respect to population growth, needs to be addressed in a better way.

Artificial intelligence has emerged as an acceptable solution for plastic recycling. This lecture presents a review and case study of the application of artificial intelligence techniques in plastics recycling.

Biography

Dr Sureshkumar, Markanday Sureshkumar, native of Madurai, India, started his academic career with a B. Sc., in Chemistry from Sourashtra College, Madurai Kamaraj University, in 1994. Then he specialized in Polymers with a Post-Graduate Diploma in Plastics Processing Technology from the Central Institute of Petrochemical Engineering & Technology (CIPET), Chennai, in 1994. Due to his research inclination, he continued master's programme in chemistry and obtained M. Sc. In 1994 and M Phil., in 2003 from Bharathidasan University, Tiruchirappalli, India. In 2011, he obtained his Ph D from the University of Pisa, Italy, by winning an International Ph D Grant.

Dr Sureshkumar is having around two and half decade's experience in academic, academic administration, research and consultancy services in various capacities. As on date he is having 60 plus publications which include research publications, review papers, book, book chapters, conference proceedings, invited lecture, etc. Presently, he is working on plastics recycling research, new product development, waste management, etc., Apart from regular interest, he is interested in learning languages, which made him to speak 8 languages. As on date he has served in Italy, Canada, Tanzania, Zambia and Ethiopia. Presently, he is working as Professor in the Department of Chemistry, Narasimha Reddy Engineering College, Secunderabad, India.

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02-04 2023
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Synthesis design and anti-inflammatory activity of novel 5-(Indol-3-yl)-thiazolidinone derivatives

Ibrahim F. Nassar[3*], Saad R. Atta-Allah[1] and Nasser S.M. Ismail[2]
Ain Shams University, Egypt

Introduction: Nonsteroidal anti-inflammatory drugs (NSAIDs) are considered the most excessively particular drugs for inflammation treatment including pain-releasing, antipyretic and rheumatoid arthritis. They inhibit the synthesis of prostaglandin by blocking the cyclooxygenation of arachidonic acid (AA) to prostaglandin G2(PGG2). This inhibition process is catalyzed by means of the enzyme cyclooxygenase (COX) of which (COX-1) and (COX-2) are two similar but diverse isoforms of the enzyme.

Objectives: The COX-2 inhibition activity of the synthesized compounds was investigated by studying their ability to inhibit the conversion of arachidonic acid to prostaglandin H2 (PGH2).

Methods: Synthesis of compounds, characterization by spectral methods, anticancer evaluation COX2 study, docking study

Results: The anti-inflammatory activity was studied revealing that a number of compounds have shown good activities

Conclusion: Thioxothiazolidin-4-one derivatives of the oxindoline ring system as well as their N-substituted analogs were synthesized and screened for COX-2 inhibition and anti-inflammatory activity in addition to related docking studies. Compounds that showed significant COX-2 inhibition were subjected to anti-inflammatory studies and docking studies. Compound 8b was found to exhibit optimal COX-2 inhibitory potency (IC50 = 5.40μM) comparable with celecoxib, so it appears promising in addition to 3a, 10 and 12. The structure–activity relationships (SAR) acquired showed that appropriate (morpholinyl-indolyl) thiazolidine structure has the necessary geometry to provide potent and selective inhibition of the COX-2 isozyme. Furthermore, analysis of the obtained results for newly prepared compounds opens the possibility for further optimization of studied compounds.

Biography

Ibrahim F. Nassar has completed his PhD at the age of 30 years from Ain Shams University, Cairo, Egypt and had 3 postdoctoral studies from 1) Rennes1 University UMR6510, Rennes, France. 2010 2) University of Granada, Spain 2013 and 3) University of Oviedo, Spain, 2015. He is the director of organic chemistry lab, He has published more than 45 papers in high ranked International journals and 1 patent, 3 posters. He has been serving as an editorial board member of Universal Journal of pharmaceutical Research, International Journal of Breast Cancer, Frontiers in Chemistry

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ORAL & POSTERS

DAY 3

5TH EDITION OF ADVANCEMENTS IN LASERS, OPTICS & PHOTONICS

HYBRID MODE
(ONSITE & ONLINE)

October
02-04 2023
Amsterdam,
Netherlands

Inverse saturable absorption in NALM mode-locked fiber laser

Haobin Zheng[1,2,†], Xiang Zhang[2,3,†], Yong Shen[2,3] and Hongxin Zou[2,3,*]

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[2]Hunan Key Laboratory of Mechanism and Technology of Quantum Information, China

[3]Institute for Quantum Science and Technology, National University of Defense Technology, China

The state-of-the-art mode-locked erbium-doped fiber lasers with a non-linear amplifying loop mirror (NALM) still have a low repetition rate. For the non-polarization-maintaining scheme, the highest is 257 MHz [1]. For the polarization-maintaining scheme, the highest is 250 MHz [2]. For the mode-locked fiber laser with a NALM, the self-starting of mode-locking is closely related to the differential non-linear phase shift (NPS). Thus, the cross-phase modulation (XPM) effect definitely makes a contribution to pulse formation and self-starting in mode-locked fiber lasers, which has not been thoroughly studied yet.

In order to overcome the difficulties of increasing the repetition rate and analyze the influence of XPM on the self-starting of mode-locking, we calculate the power distributions of two counterpropagating beams in the NALM and the differential NPS accumulations. Our analysis is carried out from the perspective of NPS accumulation. We find a difference between the differential NPSs for the CW light and the pulses in the fiber loop, which makes the NALM show an inverse saturable absorption (ISA) mechanism during the pulse formation. The ISA has been extensively studied in the real saturable absorber [3], but not in the artificial saturable absorber. The ISA in the NALM could be used to explain the experimental phenomena that the mode-locking of laser can be actively started by tapping fiber, fine-tuning light polarization, or other disturbances. These results are helpful for optimizing the design of NALM and lowering the self-starting threshold of the high-repetition-rate mode-locked fiber laser.

Biography

Haobin Zheng received the B.S. and M.S. degrees from the National University of Defense Technology, Changsha, Hunan province, China. Now, he is a technician in the Department of Physics, College of Science, National University of Defense Technology, Changsha, Hunan province, China. His research interests include fiber lasers, nonlinear optics, and spatial filtering.

Influence of laser plasma parameters on the formation of nanoscale structures on metal surfaces

Murodbek E. Vapaev* , B.R. Sobirov, I.Y. Davletov and G.S. Boltaev
Urgench State University, Uzbekistan

This work investigates the effect of laser plasma parameters on the formation of nanostructures on the surface of metals. Laser plasma parameters such as laser energy, laser wavelength, pulse duration and plasma density have been studied extensively to understand their impact on the morphology and size of the nanostructures formed on the metal surface. The experimental results show that the laser energy and laser scanning speeds have a significant effect on the formation of nanostructures. With higher laser energy and shorter wavelength, the size of nanostructures decreases. Additionally, the plasma electron density also plays a key role in the formation of nanostructures. We analyze the plasma emission spectra by calculating the electron density and temperature at conditions that correspond to the formation of laser-induced periodic surface structures (LIPSS) and nano spikes on the surface of the metals. The parameters of the induced plasma plumes were estimated for regular LIPSS and nano spikes on the surface of the titanium target. At a relatively low concentration of free electrons in the plasma of Ti target, nanospikes formation was observed. It was previously shown that the formed nanospikes circumference of the ablated area was based on the lowest of the fluence of the Gaussian beam. The formation of the nanospikes on the surface of Ti can also correlate with the decrease in the electron density of the plasma plumes during the ablation at the low-scanning speed of the ablating femtosecond laser pulses This study provides important insights into the fundamental processes involved in the formation of nanostructures on metal surfaces, which can be useful in various applications such as catalysis, sensing, electronics, sensing, optoelectronics and others.

Biography

Murodbek is teacher at Urgench State University “Interfaculty general technical disciplines”. He is involved in teaching various subjects like physics, Electrical engineering and electronics. His area of research interest focuses on Laser Physics.

Entanglement dynamics of a ladder-type atom and its spontaneous emission fields

Vahideh Tahmoorian Askari Boroojerdi
Research Institute for Applied Physics and Astronomy, University of Tabriz, Iran
University of Applied Science and Technology, Iran

We discussed the creation of entanglement between a three-level atom in a Ladder type configuration and its spontaneous emission. The entanglement is affected by parameters such as coherent driving fields' intensities, their relative phase and the incoherent pumping field's rate. We also discussed the entanglement evolution due to the spontaneously generated coherence (SGC).

Introduction

One of the most dedicated properties of quantum mechanics which differentiates it from classical physics is entanglement. In quantum entanglement, there are states of composite systems (pair of particles say) that cannot be "factorized" into separate states for the component subsystems so that any measurement on one subsystem may affect the other. This has made entanglement a potential tool in a variety of new technologies [1-3].

Equations, Results and Discussion

We consider a ladder-type atomic system as it is shown in Figure 1, and numerically calculate the entanglement of this system and its spontaneous emission fields via quantum entropy measurement.

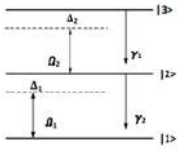


Figure 1: The equispace ladder configuration of the atomic system and the employed fields.

The basic density equations of motion for spontaneous emission which are obtained from the general master equation of a multilevel atom in an arbitrary configuration of the energy levels take the following form for a Ladder configuration.

$$\dot{\rho}_{11} = 2\gamma_2\rho_{22}, \qquad \dot{\rho}_{22} = 2\gamma_1\rho_{33} - 2\gamma_2\rho_{22},$$
$$\dot{\rho}_{12} = 2\gamma_{12}\rho_{23}e^{-i(\phi_1-\phi_2)t} - \gamma_2\rho_{12}, \qquad \dot{\rho}_{23} = -(\gamma_1+\gamma_2)\rho_{23},$$
$$\dot{\rho}_{13} = -\gamma_1\rho_{13} \qquad \dot{\rho}_{33} = -2\gamma_1\rho_{33},$$

We can enhance the entanglement just by increasing the rate of the incoherent field, R, which is displayed in Figure 2 (a), to understand the reason for this, we calculated the population dynamics of level 3 in Figure 2 (b). It is clear that the increase in the level 3 population will result in a larger fixed value of entanglement, it is understood by comparing Figure 2(a) and Figure 2(b).

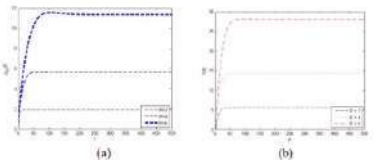


Figure 2: The system is initially in the ground state and under the influence of coherent fields with 2 1 $\Omega = \Omega = 4$, 2 and different incoherent pump field rates (a) Evolution of entanglement (b) Evolution of the population of level 3.

The effect of photobiomodulation therapy, combined with carbon material impregnated with silver nanoparticles, on infection control and repair in a bone injury model

Drielli Viana Souza*, Ayres Fernando Rodrigues, Mateus Publio, Patrícia Almeida Mattos, Dominique Cavalcanti Mello and Rodrigo Labat Marcos

Universidade Nove de Julho, Brazil

Osteomolecular surgeries are common worldwide, causing a socioeconomic impact on the country. The use of external agents such as composite biomaterials is crucial to expedite bone repair and control potential infections, thus advancing patient rehabilitation. The study of photobiomodulation therapy associated with the use of non-scarce carbon biomaterials is significant.

Objective: To evaluate the effect of Photobiomodulation Therapy associated with carbon material impregnated with silver nanoparticles on bacterial control, cell growth, and the bone repair process in an experimental model of bone injury in rat tibia.

Materials and Methods: Wistar rats were randomly distributed into groups: G1 (healthy rats); BF (bone defect); BF NT (BF without treatment); BF+C (BF with carbon material); BF+CNP (BF with carbon material associated with silver nanoparticles) BF+CNP+PBM (BF with carbon material associated with silver nanoparticles and photobiomodulation); Local PBM (808nm photobiomodulation, 100mW, 6J, 60s). The animals will be euthanized at 30-60-90 days after the injury. Blood and tibia samples will be collected for biochemical (alkaline and acid phosphatase) and morphological (histological) analyses. The functional study will include biomechanical tests (shear, resistance, and flexibility).

Biophotonic assesment and diagnosis criteria of foreign body reaction due to bioploymers and laser treatment on gluteal and facial region. A pilot study of clinical cases

JOSE MARIA MIGUEL AGUILERA CANTERO
Nove De Julho University, Brazil

Biopolymers are used commonly as fillers for aesthetic treatment in different areas, most often used in Face, Breast and Gluteal Region. Adverse effects are noticed like Edema, Stiffness of the area, pain, Granulomas, change of skin color. With the stablish of ASIA syndrome, and other clinical criteria to determine body compromise due to this reaction to the fillers. The variety of reactions, signs and symptoms are very large, and certainly unknow for the general physician.

The Objectives of this pilot study are the Assessment, Clinical Treatment, and Minimally Invasive Laser Surgery for the extraction of the major portion of foreign body reaction due to the biofillers on the human body.

In this pilot study, horizontal and prospective, with follow up post-surgical procedure are confirmed by three cases of foreign body reaction with ASIA Syndrome criteria. The biophotonic assessment done by Infrared Medical Thermography, and once the clinical criteria are concluded, the planning for the complete assessment, clinical management, laser surgical plan and procedure are designed for every case in particular.

Biography

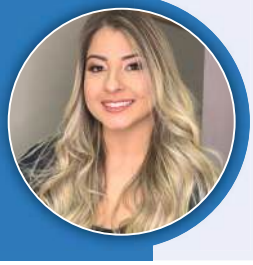
Dr. Jose Maria Aguilera is a Medical Director in Centro Láser Médico Quirúrgico Corpsnatura and Thermo Health Diagnostic and Reseach Center. Asunción, Paraguay. He is specialized in Phlebology and Lymphology and an internacional medical laser specialist.

Effect of photobiomodulation therapy on the reduction of the inflammatory process and pain control in an experimental model of induced rheumatoid arthritis

Patricia de Viveiros Tavares* , Solange Almeida dos Santos, Orlando Romano Neto, Rodrigo Labat Marcos

Nove de Julho University (UNINOVE), Brazil

Rheumatoid arthritis (RA) is classified as a chronic inflammatory disease of the joints, due its systemic autoimmune alterations, which lead to progressive irreversible degenerations of the cartilage and bones involved in the joints. RA affects about 0.5% to 1% of the global population, predominantly women. Experimental studies “in vivo” have shown that through photobiomodulation (PBM) therapy, the inflammatory modulation has been shown to be positive. The purpose of this study is to verify an “in vivo” sample in order to evaluate the effects of PBM therapy on the control of the inflammatory process and pain in an experimental model of RA. In the methodology of this work, it will be used male Wistar rats that will be divided into 4 groups: CTL (control), RA NT (Rheumatoid Arthritis not treated), RA LP (Rheumatoid Arthritis treated with local photobium), and RA VP (Rheumatoid Arthritis treated with vascular photobium systemic effect). For the induction of RA, the parameters of a previous study will be used, where the animals received 2 intradermal + systemic injections of the lesion-inducing solution on days 0, 7 and 21. For the groups to be treated, Local PBM (808nm; 6J; 100mW) and Vascular PBM (808nm; 180J; 100mW), will be introduced after the last induction. It will be noticeable the histological analysis of tissue organization and inflammatory infiltrate; Functional tests (Allodynia and mechanical properties); Biochemical/Molecular analysis (RT-PCR, Inflammatory mediators and Receptors involved in pain). The statistics that will be used: Means of the MPD and ANOVA (oneway) with Tukey’s post hoc.



Effects of photobiomodulation on ovarian function in an experimental model of policystic ovary syndrome in rats

Aline Tadeu Figueiredo Salu Catoia*, Adriana Lino-dos-Santos-Fran
Nove de Julho University (UNINOVE), Brazil

Polycystic Ovary Syndrome (POS) is a complex gynecological condition often associated with infertility and various metabolic risks, including the development of type II diabetes mellitus, dyslipidemia, cardiovascular disease, hypertension and metabolic syndrome. Several theories may explain the pathophysiological mechanisms involved in POS, which include: neuroendocrine defects, androgen synthesis/metabolism and/or action, cortisol metabolism, insulin action and/or secretion, and defects in lipid metabolism, as well as chronic subclinical inflammatory processes Conventional treatment involves drugs including metformin, orlistat and statins, but the long-term benefits are not completely clear; in addition they induce some side effects. In this sense, photobiomodulation (PBM) emerges as a promising therapy since it exerts important anti-inflammatory effects. Thus, the aim of this study will be to evaluate the effects of photobiomodulation on ovarian function in an experimental model of polycystic ovary syndrome. For this purpose, female Wistar rats will be used, submitted or not to POS induction by intramuscular administration of a single dose of estradiol valerate (2mg/0,2 ml) and treated or not with PBM (810 nm 100mW, 150s) in two points: right side and left side of the ventral surface. We will investigate clinical parameters such as: body weight, ovarian weight, quantification and gene expression of cytokines in ovarian homogenate, analysis of sex hormones, glucose and cholesterol. Considering that POS is a multifactorial disease that can induce infertility, the search for new treatments without side effects and at a lower cost is relevant.

Evaluation of the blue LED on the L929 fibroblast cell viability

Silva A.S*, Silva, R.L.O, Pires, J.A, Bussadori SK, Fernandes KPS and Mesquita-Ferrari R.A

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Fibroblasts are stromal cells responsible for the production and remodeling of the extracellular matrix and play a central role in the wound healing process. Compound diverse tissues, these cells are responsible for contractions that contribute to wound closure, with such function occurring depending on their phenotypic differentiation. Recently published studies using photobiomodulation (PBM) with low-level laser or LED showed an improvement in proliferation, differentiation, and an influence on mitochondrial and reticular activity. However, a comprehensive understanding of the ideal dosimetric parameters of PBM to stimulate wound regeneration has not yet been achieved. Therefore, this study aims to assess different dosimetric parameters of blue LED light on the L929 fibroblast cell viability. The fibroblast L929 cells line (mouse cells) was cultured in a proliferation medium composed of Dulbecco's modified Eagle medium (DMEM, Vitrocell, Campinas, SP, Brazil) supplemented with 10% fetal bovine serum (FBS, Vitrocell, Campinas, SP, Brazil) and 1% antibiotic–antimycotic solution incubated (HEPA class 3110, Thermo Electron Corporation, OH, USA) at 37 °C in a humidified atmosphere with 5% CO2. The cells were removed from the culture flask and centrifugated. The L929 cells were divided into the following experimental groups: (1) Control, (2) PBM 4 J, (3) PBM 6 J, and (4) PBM 8J. The PBM treatment was performed using blue LED (Quantum, Ecco ®, 470 nm, 400 mW, 10 s, 15 s, and 20 s and total energy of 4, 6, and 8 J, respectively) at the bottom of conic (Falcon) tubes. The cells were plated (2 x 104) in 96-well culture plates and submitted to MTT (3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide) assay for evaluation of cell viability after 24 and 48h of incubation. The results showed that after 48 h there was an increase in cell viability in the 8 J group in comparison to the 6 J group. However, after 24 hours, no statistically significant difference was observed among the experimental groups. In conclusion, the application of blue LED light with a total energy of 8J demonstrated the capability to stimulate time-dependent L929 cell viability.

Effects of pompage technique, whether combined or not with LED photobiomodulation, on pain and disability in patients with chronic neck pain: A protocol for a controlled, randomized and blind studys

Denise Cekaunaskas Kalil Lauand*, Kristianne Porta Santos Fernandes, Sandra Kalil Bussadori, Anna Carolina Ratto Tempestini Horliana and Raquel Agnelli Mesquita-Ferrari

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Chronic neck pain is a persistent condition affecting the spinal region, resulting in pain and restricted mobility. The management of neck pain often involves manual therapies, encompassing both passive and active interventions, aimed at alleviating pain, enhancing function, improving mobility, and motor control, and reducing inflammatory processes. This pain can persist for at least three months and is considered non-specific when it is not associated with any specific underlying condition, such as inflammatory rheumatic disease, osteoporosis, cancer, or radiculopathy. The use of lasers and LEDs for photobiomodulation (PBM) represents an advantageous approach to treating neck pain, given their demonstrated therapeutic efficacy in the literature. Moreover, these resources are non-invasive and easy to apply, making them an attractive option for both patients and healthcare professionals. Therefore, the aim of this study is to evaluate the effects of Pompage associated or not with PBM, using a cluster of LEDs, on pain and neck disability. This controlled, randomized and blinded clinical study includes participants of both genders, aged 18 to 45, with non-specific chronic neck pain, will be included. Participants will be randomized into two groups: (1) Pompage (n=28) focusing only on manual therapy through the Pompage technique and (2) Pompage + PBM Group (n=28) involving the same procedures as the first group, followed by PBM with a LED cluster applied for 10 minutes to the neck region. The treatment protocol consists of 10 sessions, three times per week, excluding weekends. For PBM, a cluster comprising 264 LEDs (8 mW; 4.89J; 9.6 J/cm2; 16 mW/cm² per LED) will be used, with 132 red (660nm) and 132 infrared (850nm) LEDs. Pain and functional disability will be assessed using the visual analog scale (VAS) and the Neck Pain Disability Index before and after the intervention. The resulting data will be submitted to statistical analysis considering α=0.05.

Study of photobiomodulation in the skin inflammatory process after fractional CO2 laser in rats

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Skin aging is characterized by a progressive loss of functionality and regenerative potential. There is also a reduction in hyaluronic acid and glucosaminoglycans, as well as a decrease and disorganization of collagen and elastic fibers, a reduction in vascularization, hydration and lipid content. The concern with delaying aging associated with the increase in life expectancy makes people seek more and more facial treatments. For nearly 15 years the fractional CO_2 laser was considered the gold standard for facial treatment, however it is no longer being widely used due to the long skin recovery period and the risk of serious side effects. Thus, therapeutic resources that minimize the side effects of fractional CO_2 laser are relevant. Aesthetics professionals have used photobiomodulation (PBM) to increase circulation and lymphatic drainage and mainly because of its anti-inflammatory effects after procedures with the potential to generate inflammation and its signs such as edema, redness and pain. Therefore, the objective of this study will be to evaluate the role of PBM in the inflammatory process generated after the fractional CO_2 and the resolution process in the skin. For this purpose, male Wistar rats will be submitted to CO_2 laser injury on the skin and treated or not with PBM. After 7 days, the inflammation will be evaluated through the release and gene expression of inflammatory and resolution mediators in the skin. This study will bring scientific evidence on the association of PBM with the CO_2 laser.

Randomized, double-blind, parallel, non-inferiority clinical trial for comparison between therapy with Easotic® versus photobiomodulation in canine otitis externa

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Canine otitis externa is a common dermatological inflammatory disease of the external ear canal and ear pina. Etiology is multifactorial and involves primary, predisposing and/or perpetuating factors. Clinical signs include pain, pruritus, alopecia, erythema, head shaking and malodor. Treatment typically involves the use of topical otic antibiotics, anti-inflammatories or analgesics alone or in combination. However, some topical solutions may cause ototoxicity, adverse reactions and/or increase the odds for multidrug-resistant bacteria. Photobiomodulation (PBM), also known as LLLT (low-level laser therapy) is a non-invasive method that contributes to pain relief and reduction of inflammation contributing to tissue healing. Thus, PBM may be an alternative to conventional drug treatment. The aim of this study is to compare the potential benefits of PBM in the treatment of canine otitis externa to conventional treatment with topical otic drugs. Dogs will be randomically allocated into 3 different groups: group 1 (control), treated only with a commercial cleaning otic solution; group 2 (cleaning solution + conventional drug treatment); and group 3 (cleaning solutions + PBM therapy). Our hypothesis is that the PBM anti-inflammatory effect can completely heal otitis without the need of antibiotics, antifungals and/or anti-inflammatories. A $p<0.05$ will be the level of statistical significance.

Effect of local and systemic photobiomodulation in an experimental model of osteopenia in ovariectomized rats

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Osteoporosis mainly affects postmenopausal women due to the marked decrease in Bone Mineral Density (BMD), leading to a greater occurrence of fractures and difficulty in healing. With the increase in life expectancy, osteoporosis can be considered a public health problem, generating significant costs with prevention, surgeries and long-term treatments. Among treatments, Photobiomodulation Therapy (PBM) can contribute positively and has been widely studied to determine effective protocols for osteogenesis. Objective: To evaluate the effects of PBM treatment on repair mechanisms in na experimental model of bone injury in osteopenic rats. Materials and Methods: Wistar rats will be randomly assigned to groups without (CTL) or with ovariectomy (OVX), with bone lesion without treatment (OVX+L) or with photobiomodulation (OVX+PBM), in the following parameters (PBM Local: 808nm, 100mW, 6J, 60s or SYSTEMIC PBM: 808nm, 100mW, 180J, 1800s). The animals will be euthanized 30-60-90- 120 days after the injury and blood and bone samples will be collected for analysis: Biochemical – ALP (alkaline phosphatase) and (acid phosphatase-TR); Molecular – RT-PCR (RANKL/OPG); Histological (HE) and Functional (cyclic flexion test).

Impact of vascular photobiomodulation on collagen deposition and distribution in an experimental model of acute muscular injury

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The connective elements within skeletal muscle perform structural roles and are pivotal in the process of muscle regeneration. They contribute to the modulation of inflammation and the regeneration process, a critical aspect of recovery from muscle injuries. Such injuries can result in functional limitations and discomfort for individuals, including both high-performance athletes and sedentary adults. The organization of connective tissue post-injury plays a vital role in maintaining optimal muscle function. Extensive literature supports that Photobiomodulation (PBM) can effectively modulate inflammation, reduce myonecrosis, and enhance the diameter and cross-sectional area of muscle fibers. Therefore, the aim of this study was to investigate the impact of transcutaneous vascular PBM (VPBM) administered prior to inducing acute muscle injuries in rats, on the overall collagen deposition within the healing muscle tissue following cryoinjury. A total of 15 Wistar rats were used and divided into the following experimental groups: (1) Control; (2) Injury; (3) Previous VPBM + Injury Group. The animals were submitted to the cryoinjury on the anterior tibial muscles (TA). VPBM administration was performed once, 24h before the cryoinjury procedure, by irradiating the tail artery/vein (AlGaAs, 780 nm, 40 mW, 10 J/cm², 3.2 J). Euthanasia was performed on day 2 after inducing the injuries. Muscle samples were collected, processed histologically, and stained with Picrosirius Red (Sigma-Aldrich, St. Louis, MO, USA) to quantify the total collagen area using ImageJ software. The results were subjected to statistical analysis (ANOVA/Tukey). The findings revealed a consistent organization and distribution of collagen. Notably, the Injury group exhibited a significant increase in collagen compared to the Control group, whereas the Previous VPBM + Injury group showed a significant reduction in collagen. In conclusion, prior VPBM effectively modulated collagen deposition in skeletal muscle tissue during the repair process following acute injury However, additional studies are required to delve further into the mechanisms of VPBM, especially concerning the relation to optimal dosimetric parameters.

Efficacy of 8% and 16% methyl aminolevulinate topic application followed by two red light irradiation regimens in the treatment of facial actinic keratoses: a randomized controlled clinical protocol

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The multifocality and unpredictability of actinic keratosis lesions with the potential progression to squamous cell carcinomas, and metastasis risk, make the selection of a therapeutic regimen a challenge. Additionally, the increasing incidence, associated economic costs, and impact on quality of life have leads the investigation of new protocols for the treatment of this serious skin condition. For these reasons, the aim of this study is to compare the efficacy of topical application of 8% and 16% methyl aminolevulinate (MAL) followed by red light irradiation in two therapeutic regimens of 1 hour and 3 hours in the treatment of facial actinic keratoses with a 3-month follow-up. One hundred and sixty participants will be randomized into 4 groups: G1 (control) MAL 16% with 3 hours of incubation, G2 (experimental) MAL 16% with 1 hour of incubation, G3 MAL 8% with 3 hours of incubation, and G4 MAL 8% with 1 hour of incubation. All irradiations will be performed with LED 630nm, 160mW/cm2, and 300W of power. The primary outcome will be the clinical resolution of the lesion in relation to the number of lesions within a 30-day period. Secondary outcomes will include the overall improvement of photo-damaged skin with actinic keratosis, side effects such as pain, erythema, edema, and desquamation after treatment and at 7 and 30 days, and the recurrence rate of treated actinic keratoses during the 3-month follow-up period. We will use the Kruskal-Wallis test for non-parametric data and ANOVA for parametric data. The P value will be set at 0.05.

Study of photobiomodulation in the skin collagen production after fractional CO2 laser in rats

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Skin aging is characterized by a progressive loss of functionality and regenerative potential. With increasing life expectancy, people are becoming more concerned about their appearance, increasing the demand for facial treatments. For nearly 15 years the fractional CO_2 laser was considered the gold standard for facial treatment, however, it is no longer being widely used due to the long skin recovery period and the risk of serious side effects. Aesthetics professionals have used Photobiomodulation (PBM) to increase circulation and lymphatic drainage and mainly because of its anti-inflammatory effects after procedures with the potential to generate inflammation. However, most procedures that generate inflammation are also collagen inducers. Thus, it is plausible to admit that if the inflammatory process is reduced with the use of PBM, collagen production may be reduced and thus the result may be impaired. Thus, therapeutic resources that minimize the side effects of fractional CO_2 laser are relevant. Therefore, the objective of this study will be to evaluate the role of PBM in collagen production after the fractional CO_2 in the skin. For this purpose, male Wistar rats will be submitted to CO_2 laser injury on the skin and treated or not with PBM. After 21 days, the collagen production as well as the mechanical properties of the skin will be evaluated. This study will bring scientific evidence on the association of PBM with the CO_2 laser.

The effect of photobiomodulation associated with disodium dexamethasone phosphate on the expression of inflammatory cytokines and nitric oxide in activated M1 profile macrophages

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Macrophages polarized to the M1 profile play a crucial role in the inflammatory process, being essential in the body's immune response to pathogens, tissue injuries, and other forms of cellular stress, modulating, through their products, the different phases of cellular repair. Many anti-inflammatory drugs have been used for the treatment of inflammatory processes, with one of the most common in clinical practice being the disodium dexamethasone phosphate (FD-Dexa). Despite being very effective, FD-Dexa can cause numerous side effects. The risk of adverse effects, some of which may be potentially severe, increases with higher doses and longer treatment durations. In the literature, photobiomodulation (PBM) has demonstrated its ability to attenuate the inflammatory process through various mechanisms, including the modulation of macrophage activity and secretory products, inducing polarization to an anti-inflammatory phenotype (M2), which is associated with inflammation control and tissue repair promotion. Thus, both isolated PBM and its combination with corticosteroids show potential effects on the modulation of inflammatory cytokine expression by M1 macrophages. The objective of this study is to evaluate the effects of PBM, with or without the addition of disodium dexamethasone phosphate (FD-Dexa), on the secretion of inflammatory cytokines and nitric oxide synthesis in M1-polarized macrophages. For this study, J774 macrophages will be used and evaluated in the following groups: (1) Control Group - J774 cells without any treatment; (2) M1 Group - J774 activated to the M1 phenotype; (3) M1 + PBM Group J774 activated to the M1 phenotype and submitted to PBM; (4) M1 + FD-Dexa 2µM Group including the Dexa treatment; (5) M1 + FD-Dexa 4µM Group; (6) M1 + PBM + FD-Dexa 2µM Group and (7) M1 + PBM + FD-Dexa 4µM Group. Duplicate analyses will be conducted for all experimental groups. The J774 macrophages will be activated to the M1 phenotype using Dulbecco's Modified Eagle Medium (DMEM) supplemented with 10% fetal bovine serum (FBS) and 1% antibiotic-antimycotic solution, LPS 1µg/mL and 0.2µg/mL interferon-gamma (IFN-Ɣ). They will be incubated for 2 hours at 37°C in a humidified atmosphere with 5% CO2. The PBM groups will be irradiated using an Aluminum Gallium Arsenide laser (780 nm, 70 mW, 17.5J/cm2, 1J) and FD-Dexa 2µM and 4µM will be added to the corresponding groups, and then the cells of all experimental groups will be incubated at 37°C, 5% CO2 for 24 and 48 hours. At the end of the incubation period, culture medium will be collected, total protein quantified using a Nano spectrophotometer (Nanodrop), and then analysis of IL-6, IL-1β, and TNF-α synthesis will be performed using the ELISA technique and the nitric oxide (NO) synthesis using the Griess method. Experiments will be conducted in triplicate, and data will be subjected to statistical analysis.

Combination of photobiomodulation therapy and hyaluronics acid in an invitro model of photoaging in keratinocytes and fibroblasts

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Introduction: According to the United Nations (UN) , the number of elderly people has tripled, from around 260 million in 1980 to 761 million in 2021. Aging is an inevitable process, but it is essential to understand its implications for health. Factors such as sun exposure, smoking and alcohol accelerate skin aging, damaging cells and requiring preventive care for a healthier life. Studies indicate the efficacy and safety of the simultaneous approach of Hyaluronic Acid (HA) fillers combined with Laser or LED therapies in rejuvenation. Objective: To evaluate the effect of the combination of photobiomodulation therapy and hyaluronic acid in an in vitro model of photoaging using UV light and cigarette smoke extract (CSE) on keratinocytes and fibroblasts. Keratinocytes and fibroblasts will be incubated at 37°C and 5% CO2 until reaching subconfluence, where they will be irradiated with UV light for 24 hours. After this period, cigarette smoke extract (2.5%) can be added or not and irradiated or not with Laser (diode, 660 nm, 30 mW for 180 s) and/or HA (0.1 mg/ml). After adequate culture time, the cells will be diluted and placed in 24-well plates, and the assay will be performed in triplicate. Cell viability and proliferation (MTT), quantification of IL-1β, TNF-α, IL-6, IL-10, IL-8, TGF-β (ELISA), determination of glutathione peroxidase (GPx), Superoxide activities will be carried out dismutase (SOD) and catalase, as well as collagen quantification. Data will be analyzed and graphs created using GraphPad Prism 5.0 software. Data will be submitted to one-way ANOVA followed by Newman-Keuls post-test for group comparisons.

Defect detection technology for optical transparent metallic mesh thin films

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Cracks and increase in sheet resistance harm the electromagnetic shielding effectiveness (SE) of metallic mesh films. It is necessary to find an easy way to detect these defects. By modeling the metallic mesh as a two-port network, the relationship between the transmittance and complex reflection coefficient was established to evaluate SE through vector reflection measurement. By introducing the time domain gating technique to eliminate interference from the multipath effect, a test deviation of no more than 0.95 dB @ Ku-band compared to the standard SE measurement was observed in a non-anechoic environment, which demonstrates the validity of the proposed method. Moreover, a complementary spiral resonator (CSR) operating at 7.05 GHz is developed to distinguish two typical defects by a downshift in resonant frequency and decrease in quality factor respectively. The CSR was then integrated into a feedback oscillator with an additional loop filter to achieve self-sustained measurement and self-switching effect for crack. The experimental results show that the developed sensor can detect cracks with 0.4 mm width and a 3.6 % increase in sheet resistance.

Biography

Prof. Zhengang Lu is Professor of School of Instrumentation Science and Engineering at Harbin Institute of Technology (HIT). He obtained the Bachelor, MD and PhD in Instrument Science and Technology from HIT in 2001, 2004 and 2007 respectively. He is the associate director of Key Laboratory of Ultra-precision Intelligent Instrumentation (HIT), Ministry of Industry and Information Technology, and head of the research group of micro-nano optics and electromagnetic shielding optical windows. He is a member of Optical Testing Committee of Chinese Optical Society, executive director of Mechanical Testing Instrument Branch of China Instrument and Control Society, a member of the National Technical Committee for Standardization of Electromagnetic Shielding Materials (SAC / TC323) and Micro Electro Mechanical Technology (SAC /TC336). He is also young communication expert of >>Engineering>> and <<FITEE>> of Chinese Academy of Engineering. His research interest is mainly focus on micro-nano optics and electromagnetic shielding optical windows, precision instruments and engineering.

Sandwich-type Coatings Comprising Conventional and Smart Materials. Resonant Blinding (Radiation) and Hiding (Absorption)

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The electromagnetic field interaction with a multilayered structure having a periodic interface and comprising slabs of smart artificial materials (e.g., metamaterial or graphene) is studied by means of the modified C-method furnished with certain elements of the analytical regularization technique. To understand the process of interaction of electromagnetic radiation with complex structures, like the one depicted in Fig. 1, it is necessary to have a full picture of the behavior of its constitutive elements in the electromagnetic filed.

A special attention should be payed to the study of a dielectric slab with periodic interface. Such substrate is widely used for installing and growing graphene or metamaterials layers. It is responsible for protection and tuning, distortion of undesirable resonances, for hiding or for blinding. Introduction of periodicity, which is a strongly transformative interface for electromagnetic waves, provides engineers with additional tools for electromagnetic control of coating sandwiches.

The process of interaction of electromagnetic waves with periodic interface of dielectric slab (backed with metamaterials or graphene monolayer in further applications) is modeled by means of a boundary value problem. It is resolved using the C-method with regularization. This approach ensures reliable results in numerical simulations. The predictable and set-in-advance accuracy of calculations is especially important for the study of super high-Q resonances, which are typical to the structures of interest. Extensive research on the control of resonances by optimizing the geometry of the structure and changing their electromagnetic properties has been carried out. The obtained results could serve as a basis for applications of smart coatings in various wavelength ranges and geometrical scales.

Exploring Thyroid Hormone Regulation in Skin Cells: Insights from Gene Expression Databases

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The importance of thyroid hormones on the skin has been known for a long time. Still, the mechanisms of thyroid hormone regulation in skin cells, especially at different concentrations of melanin, have been little studied. This study aimed to analyze online databases of gene expression associated with thyroid hormone metabolism in the skin.

Methods: We analyzed the datasets in the Gene Expression Omnibus (GEO) repository by searching with the keyword skin cells and filtering for tissue and homo sapiens studies. We evaluated the following genes: SLC16A2, SLC16A10, SLC10A1, SLC7A5, SLC7A8, DIO1, DIO2, DIO3, THRA and THRB. The data was log-transformed before the analyses, and the t-test or ANOVA was used. We analyzed the data using the IBM SPSS Statistics for Windows, Version 29.0. Results: We identified 23 datasets. Nine were excluded (2 neoplastic, one repeated, one blood cell, one hair follicle and four compared multiple tissues). A total of 330 samples were considered in (GSE60317, GSE58573, GSE45512, GSE53552, GSE51028, GSE50790, GSE52471, GSE41905, GSE36287, GSE30768, GSE27165, GSE32924, GSE32473 and GSE27887). Three transcripts (SLC10A1, DIO1 and THRB) information was unavailable in GSE52471. Three studies used sequencing technology, and the rest used an array. All transcripts were detected in all tissues, even considering the disease-associated samples. The UVB exposition did not modify the expression of the studied transcripts. Conclusion: Thyroid metabolism-related genes were expressed in skin cells and may vary in inflammatory disease, but UVB seems to have little impact on those transcripts' expression.

Diodes and infrared detectors based on black phosphorus/carbon nanotube heterojunctions

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Infrared detectors have bro ad application prospects in the fields of detection and communication. Using ideal materials and good device structure is crucial for achieving high-performance infrared detectors. We utilized black phosphorus (BP) and single-walled carbon nanotubes (SWCNTs) film to construct a vertical Van der Waals heterostructure, resulting in high-performance photovoltaic infrared detectors. In the device, a strong built-in electric field was formed in the heterojunction with a favored energy-band matching between the BP and the SWCNT, which caused good photovoltaic effect. The fabricated devices exhibited a diode-liked rectification behavior in dark, which had a high rectification ratio up to a magnitude of 104 and a low ideal factor of 1.4. Under 1550-nm-wavelength illumination, the 2D BP/SWCNT film photodetector demonstrated an open-circuit voltage of 0.34 V, a high external power conversion efficiency (η) of 7.5% and a high specific detectivity (D*) of 3.1× 109 cm Hz1/2/W. This η was the highest among those of the photovoltaic devices fabricated with the SWCNTs or the heterostructures based on the 2D materials and the obtained D* was also higher than those of the infrared detectors based on the 2D materials. This work showcases the application potential of BP and SWCNTs in the detection field.

Biography

Prof. Changxin Chen is affiliated with Department of Micro/Nano Electronics in Shanghai Jiao Tong University. He got his Ph.D. degree in Microelectronics and Solid-State Electronics at Shanghai Jiao Tong University and completed his postdoctoral research at Stanford University. His main research direction is nano electronic and optoelectronic device and technology based on one- or two- dimensional materials. He had authored or co-authored more than 80 peer-reviewed articles, which were published on the journal Nature Electronics, Nature, NPG Asia Materials, Advanced Materials, Nature Photonics, Nano Energy, Nature Communications, Small, Applied Physics Letters, IEEE Electron Device Letters, IEEE Transactions on Nanotechnology, etc.

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Thank You

We wish to meet you

again at our upcoming conference

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