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Part I Conference Schedule

Time: December 6- 8, 2019
Location: International Asia-Pacific Convention Center Sanya
三亚亚太国际会议中心

Date	Time	Lobby		
Dec. 6	14:00-17:00	Registration		
Date	**Time**	**Shanghai Room (上海厅)**	**HongKong Room(香港厅)**	**Tokyo Room(东京厅)**
Dec. 7	08:30-12:00	**Biomedical & Life Sciences** **Keynote Speech Session 1:** **Chair: Prof. Limin Chen** **Group photo & Coffee Break: 10:45-10:55**	**Physics Sciences** **Keynote Speech Session 1:** **Chair: Prof. Nanguang Chen** **Group photo & Coffee Break: 10:45-10:55**	**Energy Engineering** **Keynote Speech Session:** **Chair: Prof. Genbao Xu** **Group photo & Coffee Break: 10:00-10:15**
	12:00-13:30	Lunch Pacific Cafe（太平洋咖啡厅）		
Date	**Time**	**Shanghai Room (上海厅)**	**HongKong Room(香港厅)**	**Tokyo Room(东京厅)**
Dec. 7	14:00-17:30	**Biomedical & Life Sciences** **Keynote Speech Session 2** **Chair: Prof. Irina Shtangeeva** **Group photo & Coffee Break: 15:30-15:45**	**Physics Sciences** **Keynote Speech Session 2:** **Chair: Prof. Junhui Hu** **Group photo & Coffee Break: 15:30-15:45**	**Energy Engineering** **Technical Session:** **Chair:** **Group photo & Coffee Break: 16:15-16:25**
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Date	**Time**	**HongKong Room(香港厅)**	**Tokyo Room(东京厅)**	
Dec. 8	08:30-12:00	**Biomedical & Life Sciences** **Technical Session:** **Chair:** **Group photo & Coffee Break: 10:00-10:15**	**Physics Sciences** **Technical Session:** **Chair: Dr. Sergey Timushev** **Group photo & Coffee Break: 10:00-10:15**	
	12:00-13:30	Lunch Pacific Cafe（太平洋咖啡厅）		

Part II Keynote Speech

Biomedical & Life Sciences: Keynote Speech Session 1

Keynote Speech 1: Type I interferon signaling contributes to HCV and HBV persistent infections

Speaker: Prof. Limin Chen, Chinese Academy of Medical Sciences, China
Time: 08:30-09:15, Saturday Morning, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Host innate immunity, characterized by the activation of type I interferon signaling and NK cells, poses the 1st line of defense in many virus infections. Using cDNA microarray gene expession profiling, we successfully identified an 18-gene response signature that predicts whether a given patient will respond to the interferon-based therapy or not with 96% accuracy. Most of these genes are interferon stimulated (sensitive) genes (ISGs) and they are all up-regulated in treatment non-responders. We therefore identified an "ISG high" non-responder phenotype characterized by the over-activation of type I IFN signaling leading to increased expression of ISGs, especially ISG15/USP18 ubiquitin-sigaling pathway. Similar findings were observed in HBV non-responders. Further evidence on how increased ISGs affect treatment response status will also be discussed.

Keynote Speech 2: Nanobody's application in cell therapy

Speaker: Dr. Jishuai Zhang, Shenzhen PREGENE Biopharma Company, Ltd, China
Time: 09:15-10:00, Saturday Morning, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
The single domain antibody and its application in CART therapy
Bullet points:
The introduction for single-domain antibody.
The development and clinical effect of CART targeting BCMA using humanized single domain antibody as the antigen recognition domain.

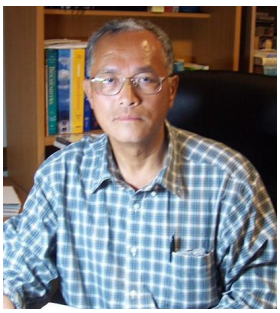
Keynote Speech 3: Engineering of Zika virus envelope protein as immunogen

Speaker: Prof. Rui Gong, CAS Key Laboratory of Special Pathogens and Biosafety, Wuhan Institute of Virology, Center for Biosafety Mega-Science, Chinese Academy of Sciences, Wuhan, Hubei 430071, China
Time: 10:00-10:45, Saturday Morning, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

The envelope protein of Zika virus (ZIKV) exists as a dimer on the mature viral surface and is an attractive antiviral target because it mediates viral entry. However, recombinant soluble wildtype ZIKV envelope (wtZE) might preferentially exist as monomer (monZE). It has been shown that the A264C substitution could promote formation of dimeric ZIKV envelope protein (ZE_{A264C}), requiring further characterization of purified ZE_{A264C} for its potential applications in vaccine development (Metz SW., *et al*., Sci Rep., 2017). We also noted that ZE_{A264C}, connected by disulfide bond, might be different from the noncovalent native envelope dimer on the virion surface. Since the antibody Fc fragment exists as dimer and is widely used for fusion-protein construction, here we fused wtZE to human immunoglobulin G1 (IgG1) Fc fragment (ZE-Fc) for noncovalent wtZE dimerization. Using a multistep purification procedure, we separated dimeric ZE_{A264C} and ZE-Fc, revealing that they both exhibit typical β-sheet–rich secondary structures and stabilities similar to those of monZE. The binding activities of monZE, ZE_{A264C}, and ZE-Fc to neutralizing antibodies targeting different epitopes indicated that ZE_{A264C} and ZE-Fc could better mimic the native dimeric status, especially in terms of the formation of tertiary and quaternary epitopes. Both ZE_{A264C} and ZE-Fc recognize a ZIKV-sensitive cell line as do monZE, indicating that the two constructs are still functional. Furthermore, a murine immunization assay disclose that ZE_{A264C} and ZE-Fc elicit more neutralizing antibody responses than does monZE. These results suggest that the two immunogen candidates ZE_{A264C} and ZE-Fc have potential utility for neutralizing antibody selection and vaccine design against ZIKV (Yang C., *et al*., J Biol Chem., 2019).

Keynote Speech 4: Equations of Life: A Single Molecule Protein Folding Hypothesis



Speaker: Dr. Yi Fang, Australian National University, Australia
Time: 10:55-11:40, Saturday Morning, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

To resolve the protein folding problem, that is: predicting the native structure and describe the folding dynamics, we must work with the fundamental physical law that directly governs protein folding process. That law is the Thermodynamic Principle

of Protein Folding, it is just the Second Law of Thermodynamics. In the protein folding case, the second law is that the Gibbs free energy achieves a minimum at the native structure.
Therefore, we have to figure out what is the Gibbs free energy. The question is, is there a Gibbs free energy function whose variables are all possible conformations of a given protein molecule? Or is it only a Gibbs free energy difference between the folded ensemble of protein molecules and its counterpart, the unfolded ensemble? The former is a microscopic view; the latter is a macroscopic view.

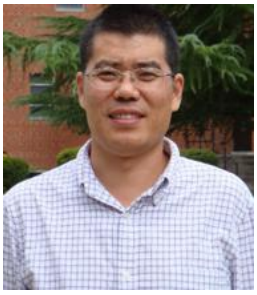
Keynote Speech 5: Transcriptional and epigenetic regulation involved in Enterovirus 71-induced pathogenesis

Speaker: Prof. Sung-Liang Yu, Dep. Clinical Laboratory Sciences and Medical Biotechnology, Natl. Taiwan University
Time: 11:40-12:25, Saturday Morning, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Non-coding RNAs including microRNA and L is the largest family of gene regulators which are involved in more than one-third of cellular processes including interaction between pathogen and host.
Enterovirus 71 (EV71) has become a newly emerging life-threatening pathogen, particularly in the Asia-Pacific region. EV71 can infect humans through fecal-oral route and spread to the central nervous system (CNS). However, there is no effective therapy for EV71 infection. Viruses rely on the host translation machinery to complete their life cycles. We found that miR-141 induced by enterovirus infection targets the cap-dependent translation initiation factor, eIF4E, for shutoff of host protein synthesis. Knockdown of miR-141 reduces viral propagation and silencing of eIF4E can completely reverse the inhibitory effect of the miR-141 antagomiR on viral propagation. EV71 also fails to induce type I interferon response efficiently although this response, elicited upon virus infection, is critical to establishing host antiviral innate immunity. We found EV71 infection upregulates miR-146a, which targets IRAK1 and TRAF6 involved in TLR signalling and type I interferon production. Knocking out miR-146a or neutralizing virus-induced miR-146a by specific antagomiR restores expressions of IRAK1 and TRAF6, augments IFN β production, inhibits viral propagation, and improves survival in the mouse model. In addition, our study showed EV71 infection upregulates miR-146a but downregulates miR-370 expression. Induction of miR-146a suppresses SOS1 expression and further triggers apoptosis of virus-infected cells. Simultaneously, virus infection-downregulated miR-370 increases GADD45 β expression and causes virus-infected cells apoptosis. Finally, we provide a new molecular mechanism underlying pathogen-host interaction wherein host cells govern isoform switching of an interferon-associated molecule in EV71 infection leading to alterations in IFN productions by NGS RNA sequencing. This finding highlights a new gene regulation mechanism in pathogen-host interaction and provides a potential strategy for establishing host first-line defense against pathogens.

Biomedical & Life Sciences: Keynote Speech Session 2

Keynote Speech 6: MicroRNA-regulated Mechanisms and it’s Application for Improving Crop Tolerance to Abiotic Stress



Speaker: Prof. Baohong Zhang, Department of Biology, East Carolina University, Greenville, USA
Time: 14:00-14:45, Saturday Afternoon, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
MicroRNAs (miRNAs) are an extensive class of endogenous, small RNA molecules that sit at the heart of regulating gene expression in multiple developmental and signalling pathways. Recent studies have shown that abiotic stresses induce aberrant expression of many miRNAs, thus suggesting that miRNAs may be a new target for genetically improving plant tolerance to certain stresses. These studies have also shown that miRNAs respond to environmental stresses in a miRNA-, stress-, tissue-, and genotype-dependent manner. During abiotic stress, miRNAs function by regulating target genes within the miRNA-target gene network and by controlling signalling pathways and root development. Generally speaking, stress-induced miRNAs lead to down-regulation of negative regulators of stress tolerance whereas stress-inhibited miRNAs allow the accumulation and function of positive regulators. Currently, the majority of miRNA-based studies have focused on the identification of miRNAs that are responsive to different stress conditions and analysing their expression profile changes during these treatments. This has predominately been accomplished using deep sequencing technologies and other expression analyses, such as quantitative real-time PCR. In the future, more function and expression studies will be necessary in order to elucidate the common miRNA-mediated regulatory mechanisms that underlie tolerance to different abiotic stresses. The use of artificial miRNAs, as well as overexpression and knockout/down of both miRNAs and their targets, will be the best techniques for determining the specific roles of individual miRNAs in response to environmental stresses.

Keynote Speech 7: Molecular Mechanism Underlying Genic Male Sterility and Biotechnology-based Male-sterility Systems for Crossing Breeding and Hybrid Seed Productionin Maize

Speaker: Prof. Xiangyuan Wan, University of Science and Technology Beijing, China
Time: 14:45-15:30, Saturday Afternoon, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
As one of the most important crops, maizenot only has been a source of the food feed, andindustrial feedstock for biofuel and bioproducts but also became as a model plant system for addressing fundamental questions in genetics. Male sterility is a very useful trait for hybrid vigor utilization and hybrid seed production. The identification and characterization of genic male-sterility (GMS) genes in maize and other plants have deepened our understanding of the molecular mechanismscontrolling anther andpollen development, and enabled the development and efficient use of many biotechnology-based male-sterility (BMS) systems for crop hybrid breeding. Here, I willreport the main progress on the identification and characterization of GMS genes such as ZmMs7, ZmMs20,ZmMs25,ZmMs30, and ZmMs33in maize, and construct a putative regulatory network controlling maize anther and pollen development by comparative genomics analysis ofthe GMS genes in maize, Arabidopsis and rice. Furthermore, I will introduce and appraise the features of more than a dozen BMS systems (e.g. MCS, DMS, SPT) for propagating male sterile lines and producing hybrid seeds in maize and other plants. Finally, I would like toprovide myperspectives on the studies of GMS genes and the development of novel BMS systems in maize and other plants. The continuous exploration of GMS genes and BMS systems will enhance our understanding of the molecular regulatory networks controlling male fertility and greatly facilitate hybrid vigor utilization in breeding and field production of maize and other crops.

Keynote Speech 8: Element concentrations in plant as an indicator of the plant systematics

Speaker: Prof. Irina Shtangeeva, Institute of Earth Sciences, St. Petersburg State University
Time: 15:45-16:30, Saturday Afternoon, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Native populations of plants include different plant species that differ at physiological, biochemical, and genetic levels. We may assume that these specific features partially result from quantitative distributions of different macro- and trace elements in the plants. During recent years an impressive progress has been made in the understanding of the processes of uptake and pathways of various chemical elements in plants. It was shown that different genotypes may differ in the demands for mineral element supply and capacity of the element uptake, transport and involvement in the plant metabolism. Differences in the plant mineral nutrition have been recognized by both agronomists and molecular biologists. It has been assumed that each plant species has developed a specific element composition, and concentrations of different elements in a plant reflect first of all plant nutrient requirements rather than concentrations of the nutrients in soil. Different plants growing in the same place often have different concentrations of trace and macro-elements. It is important to remember that under ordinary conditions, each plant part may have its own characteristic concentrations of elements. Therefore, comparisons of element concentrations in plants may not be referred to the plant as a whole but should refer to the same plant parts (e.g. roots, or leaves, or seeds). Lastly, we may assume that not only concentration of one or another element in a particular plant part of any two plant species growing in the same environment may differ significantly but relations between elements in the plants may also be different.
In the present work we compared different plant species grown both in a field and in greenhouse. The basic idea was that not only concentrations of organic compounds but also contents of macro- and trace elements in the plant species, and probably relationships between elements in different parts of the plants, may be different. The aim was to assess and to try to explain the differences and similarities in the ability of the plants to uptake and translocate different elements. We also studied relationships between various elements in different parts of the plant species, stressing the importance of not only organic but also mineral components as an additional indicator of the plant classification.

Keynote Speech 9: Wood anatomical variations in L-34 clone of Populus deltoides Bartr. ex. Marsh

Speaker: Dr. PALLAVI GAUTAM, Dev Bhoomi Group of Institutions, Dehradun, Uttarakhand, India
Time: 16:30-17:15, Saturday Afternoon, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Poplars are among the world's fastest growing industrial woods which can be used as pure or mixed plantations as well as in association with agricultural crops. It offers great scope in meeting the growing needs of wood based industries besides providing extra income to farmers. Its wood has high timber and fiber value for industrial applications. In the present study, wood anatomical properties of wooden sample of Populus deltoides were studied. The samples were taken from the local wooden market. Wooden samples were collected from healthy, well-formed trees, with more than 30 cm diameter at breast height. The wood anatomical properties of fiber length, fiber diameter, vessel element length, vessel element diameter, wall thickness and specific gravity were examined. Physical properties such as specific gravity was investigated. These properties are important for studying the trends that vary from pith to periphery depending upon the species and anatomical features. The best known and most studied within-tree (ramet) variability in wood is the change from the tree centre (the pith) to the bark, which is frequently referred to as the characteristics of juvenile and mature wood. Maceration technique was used following Schultz's method. Collected data on wood anatomical properties were statistically analyzed for mean and standard deviation. Within-disc variations showed, that variations were non-significant for most of the wood traits whereas for pooled data variations were significant only for fiber length. The study concluded as, non-significant vertical, directional and radial variations for pooled data of Populus deltoides for most of the wood traits which contributes to the homogeneous appearance of wood properties.
Keywords: wood anatomy, specific gravity, within-tree (ramet) variability, Populus deltoides

Keynote Speech 10: Ethnobotanical and Nutraceutical Investigation of Edible Wild Fruits and Vegetables of Himalayan Region of Pakistan

Speaker: Prof. Arshad Mehmood Abbasi, COMSATS University Islamabad, Abbottabad Campus, Pakistan
Time: 17:15-18:00, Saturday Afternoon, December 7, 2019
Location: Shanghai Room (上海厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

Present research work is based on Ethnobotanical and nutraceutical investigation of wild edible fruits and vegetables of Lesser Himalayas, Pakistan. Ethnobotanical information was obtained through informed consent semi-structured interviews, questionnaires, market survey and focus group conversation from different areas of Himalayan region of Pakistan. The plant samples were analysed for nutritional components, phytochemical constituents and antioxidant potential. A total of 80 wild edible plant species including 35 fruits and 45 vegetables were investigated. Inhabitant of the area used 50 medications based on wild edible fruits and 51 recipes based on wild edible vegetables to cure various ailments along with other ethnobotanical uses i.e. fooder, fuel, making agricultural tools, furniture, sheltering, fencing and as hedge plant etc. Moraceae and Papilionoideae were most quoted botanical families of wild fruits and vegetables. Morus nigra showed highest mean culture importance values (mCI) within top ten fruit plants, followed by Morus alba, Olea ferruginea, and Berberis lyceum. While among vegetables Ficus carica was most cited species, followed by Ficus palmate and Bauhinia variegata, and Solanum nigrum. Juglans regia and Cichorium intybus showed highest nutritional potential in fruits and vegetables, respectively. Potassium metal exhibited highest average levels, followed by Ca and Mg, while lowest levels were observed for Li, Cd and Cr in the fruit and vegetable samples. Significantly higher phenolics, flavonoids, flavonols, ascorbic acid contents and antioxidant activities were observed in Phoenix dactylifera and Juglans regia (Fruit), and Origanum vulgare, Amaranthus viridis, and Ficus palmate in vegetables. Mostly random and broad distribution of the nutrient, selected metals and phytochemical contents was found in the fruits and vegetables. Antioxidant activities revealed significant correlation with most of the phytochemical contents. Principal component analysis (PCA) revealed significant anthropogenic contamination of the selected metals in the fruits and vegetables mostly contributed by transportation activities, industrial emissions and domestic waste. Most of the wild edible plant species in the study areas have no protection, but acquisition of economic benefits such as genetic improvement of existing crops from their wild ancestors and nutritional requirement from these wild edibles might promote local people’ s interest in the conservation and maintenance of these important and threatened species. Further exploration is still required to investigate useful and toxic compounds, pharmacological study; skill training in home gardening, biotechnological techniques to improve yields and income generation through large scale promotion of these wild edible fruits and vegetables.

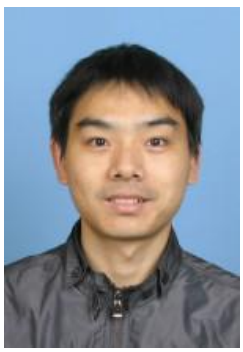
Physics Sciences: Keynote Speech Session 1

Keynote Speech 1: Combining multiphoton fluorescence microscopy with focal modulation for improved penetration depth

Speaker: Prof. Nanguang Chen, National University of Singapore, Singapore
Time: 08:30-09:15, Saturday Morning, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Nonlinear fluorescence microscopy methods, including two-photon and three-photon microscopic methods, have become increasingly popular in biomedical researches. Due to highly selective excitation of fluorophores, nonlinear light microscopes enjoy a much-improved imaging depth than single photon fluorescence microscopes. With the help of low-repetition femtosecond lasers, some groups have achieved greater than 1 mm penetration depths in mouse brain. We have been investigating the potential of combining nonlinear light excitation with focal modulation in attempt to further reduce the strong background and bring the penetration depth to 2 mm and above. We have focused on design issues of spatiotemporal phase modulator, a key component for additional background rejection. Various designs have been evaluated and optimized to achieve the best combination of modulation depth, background modulation, as well as spatial resolution.

Keynote Speech 2: Highly efficient nitride-based blue/green/ultraviolet light-emitting diodes



Speaker: Prof. Shengjun Zhou, Wuhan University, China
Time: 09:15-10:00, Saturday Morning, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Nitride-based light-emitting diodes (LEDs) have attracted considerable interest for their applications in solid state lighting, automotive front lighting, and high-resolution micro-display due to their inherent advantages such as long lifetime, high luminous efficiency, low power consumption, and compact volume. Owing to the large different in refractive indices between GaN and surrounding air, the light extraction efficiency of GaN-based LEDs is low caused by the total internal reflection (TIR) of the emanated light at the

GaN/air interface. This talk will outline the emerging challenges in the design and fabrication of micro/nano-structures for improving light extraction efficiency of GaN-based blue/green/ultraviolet LEDs. Recent development from our group in developing high-efficiency light-outcoupling micro/nano-structures, such as patterned dual-layer ITO, patterned SiO2 current blocking layer, nanoscale patterned sapphire substrate, sidewall nano-prism, embedded air cavity array, microstructured SiO2 lens, and metal wire gird transparent conductive electrode will be discussed. Moreover, the recent development in fabricating Mini-LEDs for high-resolution micro-display will also be introduced.

Keynote Speech 3: Measurement accuracy, design and calibration of optical fiber-based sensors in engineering based on strain transfer theory

Speaker: Prof. Huaping Wang, School of Civil Engineering and Mechanics, Lanzhou University, China
Time: 10:00-10:45, Saturday Morning, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Optical fiber sensors are the most promising technique in monitoring physical and chemical variables of engineering structures. For the brittle material characteristics, a bare sensing fiber is prone to breakage under the shear or torsional action existed in the construction and operation. To guarantee the survival and long-term service of the sensors, the packaging measure is particularly significant. This treatment generates an intermedium layer between the sensing fiber and the monitored structure, which leads to the strain of the host material not entirely transferred to the sensing fiber for a portion of strain loss in the transferring path. To correct the error and improve the measurement accuracy, strain transfer theory is developed to establish the quantitative strain relationship between the sensing fiber and the host material. A state-of-the-art review on strain transfer theory of optical fiber based sensors developed for civil structures is addressed. It aims to demonstrate the advance, the application and the challenge of strain transfer theory and provide scientific guidance for the better understanding of the multi-layered sensing model and the theoretical instruction for the optimum design, calibration and measurement accuracy enhancement of optical fiber sensors.

Keywords: optical fiber sensor, strain transfer theory, measurement accuracy, error modification, optimum design, civil engineering

Keynote Speech 4: Quantum cascade laser absorption spectroscopy and applications

Speaker: Prof. Jingsong Li, Anhui University, China
Time: 10:55-11:40, Saturday Morning, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

Tunable diode laser absorption spectroscopy (TDLAS) is an excellent method for trace gas detection, since it presents advantages of high sensitivity, good selectivity, fast response and high temporal resolution. With the rapid development of laser fabrication technology, quantum cascade lasers (QCLs) have emerged as attractive laser sources for mid-infrared (MIR) spectroscopic applications. In this paper, state-of-the-art quantum cascade laser based TDLAS gas sensor is demonstrated as a promising new tool for noninvasive, real-time identification and quantification of trace gases in environmental atmosphere monitoring and isotope analysis, human breath gases diagnosis, gas exchange process between soil and atmosphere, and Volatile Organic Compounds (VOCs) analysis and remote sensing, etc.

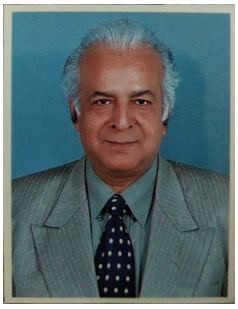
Keynote Speech 5: Optical fiber sensors engineered with femtosecond lasers

Speaker: Prof. Xuewen Shu, Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China
Time: 11:40-12:25, Saturday Morning, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

Femtosecond lasers have become a very powerful and convenient tool to fabricate micro-/nano-structures in different materials and waveguides. Based on refractive index modification, femtosecond laser inscription technique can directly fabricate a variety of structures such as gratings, interferometers and waveguides with great flexibility. In this talk, we will review our past and recent research work on the development of optical fiber sensors based on femtosecond laser inscription technique. We will discuss various kinds of micro-structures fabricated with femtosecond laser in optical fiber and demonstrated their applications as sensors for measuring different physical parameters.

Keynote Speech 6: UNCONVENTIONAL LASERS



Speaker: Prof. Kamal Nain Chopra, Former Scientist G, Laser Science and Technology Centre (LASTEC), DRDO, India
Time: 12:25-13:10, Saturday Morning, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

A lot of literature, especially books on the conventional lasers like Solid state lasers, Gas lasers, and Semiconductor lasers is available. However, not many efforts seem to have been made on writing books on unconventional lasers. This Keynote Address is a small but sincere effort of the author to make available very useful information on this topic, especially from the research point of view. In addition, the technical analysis of the theoretical aspects of these lasers along with the modeling and designing considerations for maximizing the efficiency of these lasers has been presented in this Keynote Address. Apart from discussing the theoretical modeling and designing of these lasers some related experimental results available in the literature have been presented to make the presentation clear and meaningful. Nearly all types of unconventional lasers including X-ray FELs (XFELs), GaSb-based Type-I Diode Lasers Photonic crystal based lasers, Phase Conjugated Lasers, Quantum Cascad Lasers, and Diode pumped Fiber Lasers, have been covered. All these types of lasers are having many useful applications in various fields like Industry, surgery, biology, and novel imaging techniques, apart from their usage in practical research applications in most of the scientific and engineering topics. In the field of medicine, these lasers are applied on several areas, including dermatology, in which they are used to skin tone more even. Vascular skin lesions are known to contain oxygenated hemoglobin, which has the characteristic of strongly absorbing the visible light at 418nm, 542nm and 577 nm, and the pigmented skin lesions contain melanin, which has a wide range of absorption in the visible and IR wavelength regions. The Phase Conjugated Lasers are very useful for certain applications like – nullifying the optical distortion and also achieving some novel characteristics of the lasers. The Fiber laser along with the Raman converter module is capable of the efficient spectral conversion of its unique combined ultra-short radiation pulses into longer-wavelength spectral domain of 1150 to 1550 nm. Tourmaline Ytterbius-1100 has many applications like - time-resolved spectroscopy, Raman spectroscopy, micro- and nano-photonics, supercontinuum generation, fluorescence-lifetime imaging microscopy, and optical DNA sensing technology. The Unconventional Lasers based on Photonic crystals are very useful for certain applications like – data storage, biomedical applications, and display technologies. GaSb-based Type-I Diode Lasers Operating in the Optical Spectral Region are very useful for a variety of applications including trace gas sensing, free-space optical communications, and infrared countermeasures. The field of Quantum Cascaded Lasers (QCLs) has recently grown fast due to the fact that these lasers are having great advantages over the other semiconductor lasers, and consequently have found newer applications. Higher Powers from Femtosecond Fiber Lasers have become very useful for a variety of applications including laser processing, medical bio-optics, and opto-electronics The studies on the Cr:Colquiriite lasers - Cr:LiSaF and Cr:LiCaF Lasers, have

also drawn the attention of various researchers , because of their main advantage, that they can be pumped by diodes (GaInP / AlGaInP QW), and therefore, are quite compact and inexpensive. Ti:sapphire lasers are popular and important because of the fact that they (i) are tunable lasers, capable of emitting red and near-IR radiations in the spectral region 650nm to 1100 nm, and (ii) generate ultra short pulses. Because of these characteristics, they have become very handy for carrying out scientific research. As is well known, the Random lasers have also been drawing the attention of various researchers because of their unique theory, fabrication, and properties. It has now been well understood that this Novel laser produces random mid-infrared light, and because of the great advantage of its capability of removing speckling, has important applications in the systems requiring high image quality e.g. airport security. Raman Lasers, Spin lasers, and ultrafast mid – IR lasers are also useful in research and other upcoming fields. The amazingly high intensities of X-ray free-electron lasers - 108 – 1010 times greater than the ordinary laboratory sources, have led to their great application in the very highly specialized areas of scientific research.

Physics Sciences: Keynote Speech Session 2

Keynote Speech 7: Principle, Structure and Characteristics of MOS Gas Sensors Assisted by Ultrasound

Speaker: Prof. Junhui Hu, Nanjing University of Aeronautics and Astronautics, China
Time: 14:00-14:45, Saturday Afternoon, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
The metal oxide semiconductor gas sensor has the merites such as fast response, quick recovery, good durability, long working life, lower cost, and excellent portability. An improvement in its sensitivity and selectivity will definitely widen its application range. The existing methods for improving its sensitivity include the utilization of nano porous sensing materials, doping, optimization of the grains of sensing materials, and UV light irradiation. The existing methods for improving its selectivity include the doping and working temperature modulation. Recently, the author’ s research group proposed a new strategy not only capable of significantly raising the sensitivity of MOS gas sensors, but also providing a possibility to identify various reducing and oxidizing target gases. The strategy utilizes ultrasonic radaition to enhance the target gas transfer onto the sesning layer, to change the sensing chanracteristics of a MOS sensor. In this talk, the principle, structure and characteristics of MOS gas sensor systems assisted by ultrasound will be given, as well as their potential applications.

Keynote Speech 8: New sound technology with broad band resonators to stop the sound and eliminate noise

Speaker: Prof. Feo V Kusmartsev, ITMO University, Russia
Time: 14:45-15:30, Saturday Afternoon, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
A new technology for sound attenuation based on a broad band resonating system has been developed. A plurality of nested broad band resonators can be used to form an acoustic shield protecting against sources of unwanted noise in a very broad spectrum. The technology has the advantage of having spaces between each resonator, in stark contrast to conventional solid sound barriers. We aim to use this technology to create novel acoustic barriers for use in a number of situations but specifically: Alongside roads/rail in applications where a combination of soundproofing and air flow is needed. No currently available sound barriers for road/rail use enable penetration of both air and light whilst simultaneously providing sound attenuation. Around machinery (air-conditioning units, fixed industrial machinery, pneumatic drilling) where the environment needs to be protected from sound whilst still maintaining airflow around the machinery. I will present detailed design concepts, optimised to application, with full scale working prototypes built.

Keynote Speech 9: Investigation on ultrasonic motors for ventricular assist devices

Speaker: Prof. Yang Ming, Shanghai Jiaotong University, China
Time: 15:45-16:30, Saturday Afternoon, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Background: Worldwide the number of heart failure patients exceeds 23 million, in which 5-10% of total heart failure patients may become unresponsive to conventional treatments. Although heart transplantation is a gold standard of treatment for heart failure, heart transplantation is limited by the availability of donor hearts. Fortunately, rapid advances in technology have enabled durable mechanical circulatory support emerged as an increasingly viable therapeutic option for treatment of heart failure patients as bridge to heart transplantation, or life time support as destination therapy. These mechanical circulatory

support devices provide effective hemodynamic support, high device reliability and significant improvements in patient status.However mechanical circulatory support therapy is accompanied severe adverse complications including pump thrombosis, bleeding, stroke, and right ventricle failure, which are mainly associated with the electromagnetic actuators.

Methods: To develop a ventricular assist device with low rate of adverse complications, several actuating technologies are investigated in terms of response time, thrust force, weight, volume, and controllability. No commercial product is available meeting the requirements. To explore the feasibility of ultrasonic motors, the long lifetime drive of traveling wave ultrasonic motors, heat dissipation, and stable vibration tracking technologies are investigated to be the actuator of ventricular assist devices. Finally, a pulsatile blood pump prototype is developed and investigated in a mocked circulatory system.

Results: A flow of 5L/min is achieved with an average after load of 100mmHg with a size close to the continuous flow ventricle assist device. A shifting vortexflow is found in blood chamber to form a persistent rotational flow pattern through the cardiac cycle， similar to the blood flow in the left ventricle.

Keynote Speech 10: Four Algorithms for Boundary Control with Breaking in Space and Time

Speaker: Prof. Vladimir Arabadzhi, Institute of Applied Physics (RAS), Russia
Time: 16:30-17:15, Saturday Afternoon, December 7, 2019
Location: Hongkong Room (香港厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Typically, active control systems either have a priori complete information about the boundary-value problem and damped waves before switching on, or get it during the measurement process or accumulate and update information online (identification process in adaptive systems). In this case, the boundary problem is completely imprinted in the information arrays of the control system. However, very often complete information about a boundary-value problem is not available in principle or this info is changing in time faster than the process of its accumulation. The article considers examples of boundary control algorithms based almost without information. The algorithms presented in the article cannot be obtained within the framework of the harmonic representation of the problem by complex amplitudes. And these algorithms carry out fast control in microstructured boundary problems. It is shown that in some cases it is possible to find simple solutions if we remove restrictions: (a) on the spatio-temporal resolution of controlling elements of a boundary-value problem (and these are not methods of analytic extrapolation); (b) on the high-frequency radiation of the controlled boundary.

Keywords
Incident Low Frequency Wave, High Frequency Technological Radiation, Fast Control in Microstructured Boundary Problems, Binary Breaker, Breaker-Inverter Length of Damping, Inverter, Spinning Acoustic Blades, Gas Stream.

Physics Sciences: Keynote Speech Session 3

Keynote Speech 11: Challenge to Black Hole Models and Supernova explosion driven by Magnetic Monopoles

Speaker: Prof. Qiuhe Peng, Department of Astronomy, Nanjing University, China
Time: 08:30-09:15, Sunday Morning, December 8, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
1) A unusually strong radial magnetic field detected near our Galactic Center (2013) is consistent with the prediction from our model of supermassive object with magnetic monopoles (MM) (Peng and Chou 2001). The important implications of the unusually strong radial magnetic field near the GC are: a) A strong evidence of the existence of MM;
b) The black hole model of the suppermassive object at the GC is nonphysical (Peng et al., 2016; 2017).
c) MM may catalyze nucleon decay (Rubakov -Callen effect) may be real.
2) I shall also give query on the black hole models for other quasars and active galactic nuclei. The key dilemma of the black hole model is the question on the BH mass at the center of AGNs. However, the dilemma will disappear in our model of Supper-massive Stars with MM.
3) Taking the RC effect as an energy source, we have proposed an unified model for various supernova explosion (Peng et al. 2017). In our model, the remnant of the collapsed core of supernova is still a neutron star rather than a black hole no matter how huge of the supernova mass. That means, black holes with stellar mass are impossible to be formed through supernova explosion.
4) We may explain the physical reason of the Hot Big Bang of the Universe with the similar mechanism of supernova explosion by using the RC effect as an energy source. That is, the primordial Black hole of the whole Universe is no physical.

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"Some new possible anticipated signals for existence of magnetic monopoles?"
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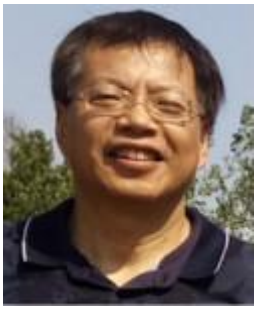
Keynote Speech 12: On the kinematics of Jet motion of Black hole systems



Speaker: Prof. Biping Gong, Huazhong University of Science and Technology
Time: 09:15-10:00, Sunday Morning, December 8, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Faster than light or superluminal motion was originally predicted as a relativistic illusion of ballistic moving ejecta, and confirmed in a number of sources observationally. However, the recent results of the long bas line observations display vertical acceleration motion of ejecta, which are unexpected by the ballistic scenario.
This indicates the existence of non-ballistic jet motion, in which a continuous jet produces a discrete hot spot. And the precession of such a hot spot in the plane of the sky appears superluminal. Therefore, a unified and simple interpretation to the new results is obtained, which is of importance in the understanding of the nature of superluminal motion, the interaction of jets and surrounding materials, as well as the common physics underlying quasars and microquasars.

Energy Engineering: Keynote Speech Session

Keynote Speech 1: Industrialization of Triumph Group CIGS Thin Film Module

Speaker: Prof. Genbao Xu, Triumph Photovoltaic Materials Co.Ltd., China
Time: 08:30-09:15, Saturday Morning, December 7, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
The report mainly describes the basic knowledge and development of CIGS module, and the strategy and progress of CIGS thin film module of Triumph Group. The report will be divided into five parts: 1) Introduction of CIGS industrialization of Triumph Group, including development history, strategy and the technical origination; 2) Brief review of CIGS solar mechanism, such as the power generation principle and CIGS process flow; 3) Introduction of research and development as well as construction of manufacturing base of CIGS, i.e. the founding of Triumph Photovoltaic Materials Co. Ltd. (TPVM) and its progress of R&D and mass production; 4) Development status and prospect of Triumph Group for CIGS, which emphasizes on the technological advantages and development status as well as its future development plans; 5) BIPV application of CIGS module, such as applying CIGS module to factory building, office building and Stadium, etc.

Keynote Speech 2: The recycling of various wastes for the electrode materials rechargeable battery

Speaker: Prof. Hongying Hou, Kunming University of Science and Technology, China
Time: 09:15-10:00, Saturday Morning, December 7, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
In this article, the rapid development of modern social economy and the growth of the population inevitably result in the production of a large quantity of various industrial wastes or domestic garbages such as waste Cu circuit printed board etchant, waste Cu scraps, expired medicine, waste cigarettes butts etc. Therefore, in order to stimulate the circular economy mode and protect the environment, it is urgent how to reasonably these wastes. For this purpose, the investigations of a series of wastes were carried out by various methods and routes such as thermal routes, sol-gel, high temperature solid reaction, electrodeposition, liquid reaction and so on. Resultantly, a series of function materials with controllable morphology were obtained, as shown in

the following figures. Furthermore, the corresponding application feasibilities as the electrode materials in the rechargeable batteries were also evaluated. Thus, both the circular economy and low consumption of fresh raw mineral materials would be achieved, which no doubt facilitate the sustainable development and the harmony between the people and the natural environment.

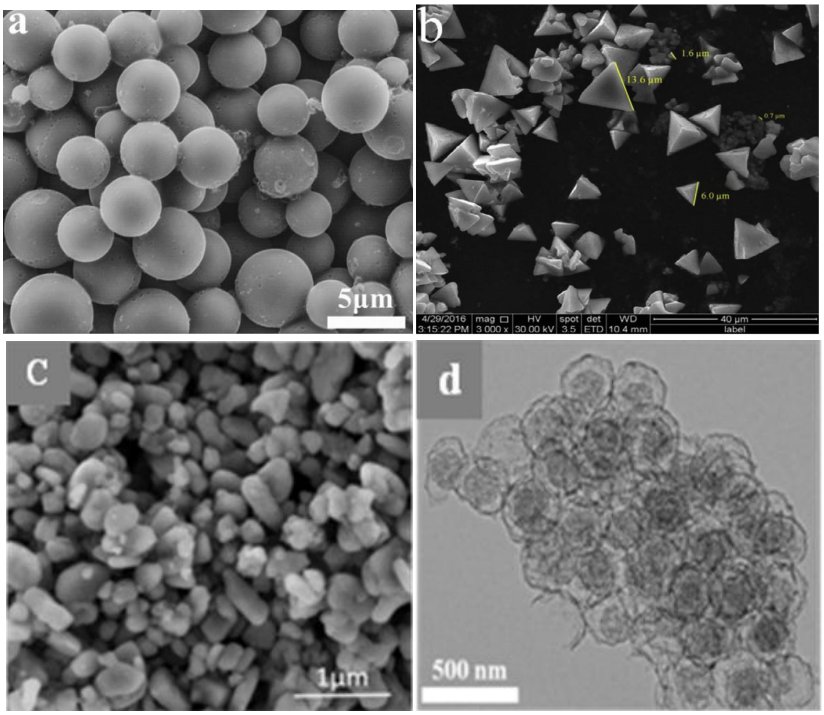


Fig.1 SEM images of (a) N-doped carbon microspheres derived from expired vitamin B1 injection, (b) tetrahedron-like CuCl from waste Cu scraps, (c) $LiFePO_4$/C powders from expired medicines of lithium carbonate and ferrous sulfate; (d)TEM image of N/S co-doped hollow nanospheres derived from waste donkey-hide gelatin pulp;.

Keynote Speech 3: Strong Electro-Chemo-Mechanical Coupling in High-Capacity Electrode Materials

Speaker: Prof. Hui Yang, Department of Mechanics, Huazhong University of Science and Technology, China
Time: 10:10-10:55, Saturday Morning, December 7, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
The growing demand for low-cost, high-performance rechargeable battery techniques for portable electronics, hybrid electric vehicles, and large-scale energy storage has stimulated the relentless search for new electrode materials. The successful development and application of such newly identified materials necessitate a fundamental understanding of the electrochemical and mechanical properties of the materials, as well as the intrinsic electro-chemo-mechanical coupling mechanisms

in these materials. In this talk, I will present a combined experimental and computational investigation of deformation and failure in high-capacity electrode materials such as silicon, germanium, carbon nanotube, and graphene for their use in advanced rechargeable batteries. The strong coupling between electrochemical charging/discharging kinetics and mechanical stress in these high-capacity electrode materials will be uncovered, which will shed light on the design of new generation failure-resistant electrodes.

Keynote Speech 4: Photovoltaic Chiral Magnetic Effect in Topological Semimetals

Speaker: Prof. Katsuhsia Taguchi, Yukawa Institute for Theoretical Physics, Kyoto University, Japan
Time: 10:55-11:40, Saturday Morning, December 7, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract

Electrons have two properties, charge and spin. While the technology that controls the degree of freedom of charge is conventional electronics, "Spintronics" is a new technology that controls both "charge" and "spin", which are the basic properties of electrons. Hence, spintronics could bring innovation to electronics, which is a control technology by charge degrees of freedoms. Recently, a study of electronics and optics in topological materials (e.g., Dirac semimetal [1], Weyl semimetal [2], and line-node semimetals [3]), which host Dirac and Weyl fermions in bulk, have been attracting much attention. The properties of Dirac and Weyl fermions have been both theoretically and experimentally studied in many fields of physics. These fermions drive unconventional transport and optical responses [4]. These phenomena could be applicable to novel electrical and optical functional devices in future.

Among these characteristic phenomena in topological materials, in this talk, we will present a study of light-induced charge current (dubbed as photovoltaic chiral magnetic effect) in Weyl semimetal [5]. Here, the photovoltaic chiral magnetic effect is caused when we apply circularly polarized light in Weyl semimetals with time-reversal symmetry. The applied circularly polarized light generates the charge current along the light propagation direction. Its charge flow is controllable by chirality of the circularly polarized light via inverse Faraday effect [6].

Besides, we will talk the study of photovoltaic anomalous Hall effect in line-node semimetals (e.g., Ca_3P_2). The photovoltaic effect is the optical anisotropic, and it could be applicable to photodetector based on the line-node semimetals [7].

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Keynote Speech 5: Storage of Renewable Energy and Hydro Potential

Speaker: Prof. Mamata Kumari Padhy, Mechanical Engineering Department ,ITER, SOA Deemed to be University, India
Time: 11:40-12:25, Saturday Morning, December 7, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Energy plays a key role in economic growth of a country. It is obligatory to produce the required amount of energy with prominent productivity for fulfillment of human need and social advancement. There are different sources of renewable energy available viz. small hydro, wind energy, biomass, solar energy, geothermal, tidal power etc. Consider remote areas, villages in Himalayan range, Small Island; where grid connection is a difficult task. These people usually depend on renewable energy sources. If managed systematically, these areas can be provided with electricity uninterruptedly by renewable energy sources with energy storage facility. All renewable energy sources has their own limitations, so the available energy should be stored when it is surplus. The present topic discusses about the different storage process and facilities.

Keynote Speech 6: Parameters Optimization for Electrocoagulation/ Flotation Process in Removal of Acid Red 14 with Mesh Stainless Steel Electrodes

Speaker: Prof. Hossein Ganjidoust, Tarbiat Modares University, Iran
Time: 14:00-14:45, Saturday Afternoon, December 7, 2019
Location: Tokyo Room (东京厅), 3rd Floor, Conference Building, International Asia-Pacific Convention Center Sanya

Abstract
Dyes are constant compounds that are not easily biodegradable and are considered as cancerous agents. Electro-coagulation and electro-floatation method due to adaptability and compatibility with environment is regarded as one of the appropriate method for the treatment of wastewater industries containing dye. In this study in which stainless steel mesh electrodes with horizontal arrangement are used, the most important parameters affecting on the performance of simultaneous system of electro-coagulation and electro-floatation including electrodes area, the distance between electrodes, solution ' s electrical conductivity, type of

electrolyte, and initial pH were examined and the effect of every one of these parameters in color removal efficiency of Acid Red 14 from artificial wastewater, energy consumption and anode was determined and their values were optimized. The area of electrode equals 20.5 cm2, the distance between the electrodes 0.5 cm, electrical conductivity 3600uu S/cm, and initial pH 7 were selected as the optimum values, and dye removal efficiency of 99 % with initial concentration of 150 mg/L and electric current density 40 mA/cm2 (0.8 A) were obtained under optimum condition and within 20 minutes. The advantages of this method are low energy and material consumption beside the low produced sludge.

Part III Technical Sessions

Biomedical & Life Sciences: Technical Session

Session Chair:

Hongkong Room (香港厅), 3rd Floor, Conference Building 08:30-12:00, Sunday Morning, December 8, 2019

ID	Paper Title	Author	Affiliation
08:30-08:45	Variations in Hepatitis B virus genome and their importance on disease progression	Ahmed A. Al-Qahtani	King Faisal Specialist Hospital & Research Centre, Saudi Arabi
08:45-09:00	Phosphorylation of AMMECR1at Serine16 is not essential for its nuclear localization	Huamin Zhou	Xiamen University
09:00-09:15	Matrix Softening Induces Inflammatory Signals of Endothelial Cells	Weicong Chen	Shanghai Jiao Tong University
09:15-09:30	Transcriptomic profiling of microglia and astrocytes throughout aging	Pan Jie	Biomedical Research Institute, Shenzhen Peking University - The Hong Kong University of Science and Technology Medical Center
09:30-09:45	Response of the rhizosphere fungi community diversity and structure of massion's pine inoculating with Suillus luteus in Mining area	Peiyi Yu	Central South University of Forestry and Technology
09:45-10:00	Fomitopsis pinicola collected from British Columbia, Canada has anti-proliferative activity	Jiazhi Da	University of Northern British Columbia
10:00-10:15	A polyU polymerase CDE-1 suppresses the production of antisense ribosomal siRNA by coupling 3'-end polyuridylation and degradation of 26S rRNA	Yun Wang	Huainan Normal University
10:15-10:30	**Coffee Break**		
10:30-10:45	LC Domain Mediated Coalescence Is Essential for Otu Phase Separation and Enzymatic Activity	Qingshuang Cai	Anhui Agricutural University

10:45-11:00	Sequencing and Analysis of Transcriptome on Leaf of Swida wilsoniana of the Woody Oil Plant	Zhou Xiao	Central South University of Forestory and Technology, College of Life Sciences and Technology
11:00-11:15	Deficiency of apoptosis-stimulating protein 2 of p53 protects mice from acute hepatic injury induced by CCl4 via autophagy	SHI HONGBO	Beijing Institute of Hepatology, Beijing Youan Hospital, Capital Medical University
11:15-11:30	Single-Cell RNA Sequencing Analysis Reveals Sequential Cell Fate Transition during Human Spermatogenesis	Gang Chang	Shenzhen University
11:30-11:45	Aurora Kinase inhibitor Tozasertib Suppresses the Mast Cell Activation In Vitro and In Vivo via Downregulating Cellular NF-κB and MAPK Pathways	Jia-jie Chen	School of Medicine, Shenzhen University
11:45-12:00	Phytosociology – the useful tool of assessment of past and future human impact on plants and forest ecosystems	Monika Konatowska	Poznań University of Life Sciences
12:00-12:15	A Study on the Change Characteristics of CO2, CH4 and N2O Emission Fluxes in Ebinur Lake's High Salinity Wetland Soils of under Different Typical Plant Communities	Yanhong Li	School of Geographical Science & Tourism, Xinjiang Normal University
12:15-12:30	Preliminary Analysis of Sapindus mukorossi Extracts from Different Sources for their Antifungal Potential against Forest Fungi	Prerana Badoni	Dev Bhoomi Group of Institutions, Dehradun, Uttarakhand, India
12:30-12:45	Construction of anaerobic gut-on-a-chip model and its application for Clostridium difficile infection study	Hui Wen	Institute of Synthetic Biology, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences
12:45-13:00	Investigation of bacteria cell-size homeostasis mechanism under environmental perturbation using mother machine	Yue Yu	Institute of Synthetic Biology, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences

Poster	CircTulp4 functions in Alzheimer's disease pathogenesis by regulating its parental gene, Tulp4	Nana Ma	Biomedical Research Institute, Shenzhen Peking University - The Hong Kong University of Science and Technology Medical Center
Poster	Lanosterane triterpenes with anti-inflammatory activities from the fruiting bodies of Inonotus obliquu	Rongwei Kou	Northwest A&F University
Poster	Bioactive Aromadendran Sesquiterpenes from the fruits of Pittosporum tobira	Yao Liu	Northwest A&F University
Poster	Thiodiketopiperazines with Tyrosinase Inhibitory Activity from The Endophytic Fungus Phaeosphaeria fuckelii	Yijie Zhai	Northwest A&F University
Poster	Study on desensitization of raw lacquer and its antibacterial activity	Chen Fan	Northwest A&F University
Poster	Bioactive Cassane Diterpenes from the stem of Ceasalpinia pulcherrima	Jiayao Zhang	Northwest A&F University

Physics Sciences: Technical Session

Session Chair: Dr. Sergey Timushev, Moscow Aviation Institute

Tokyo Room (东京厅), 3rd Floor, Conference Building 8:30-12:00, Sunday Morning, December 8, 2019

ID	Paper Title	Author	Affiliation
Keynote Speech	Challenge to Black Hole Models and Supernova explosion driven by Magnetic Monopoles	Prof. Qiuhe Peng	Department of Astronomy, Nanjing University, China
Keynote Speech	On the kinematics of Jet motion of Black hole systems	Prof. Biping Gong	Huazhong University of Science and Technology
10:00-10:15	**Coffee Break**		
10:15-10:30	Remnants of first stars for gravitational wave	Tomoya Kinugawa	University of Tokyo

	sources		
10:30-10:45	High resolution photoacoustic tomography system for whole mouse brain imaging based on full-ring ultrasound array	Lijun Deng	Guangdong University of Technology
10:45-11:00	The precise analytical modeling and measurement of the fractional thermal loading in a laser medium	Yaoting Wang	Xi'an Technological University
11:00-11:15	NUMERICAL STUDIES OF BPF PRESSURE PULSATION IN CENTRIFUGAL VENTILATORS	Sergey Timushev	Moscow Aviation Institute
11:15-11:30	Assessment of Whole-body vibration produced by machines used in processing of mineral raw materials	Jacek Zajac	Central Institute for Labour Protection - National Research Institute
11:30-11:45	Measurements of vibration using a high-speed camera – preliminary tests	Piotr Kowalski	Central Institute for Labour Protection – National Research Institute, Warsaw, Poland
11:45-12:00	Acoustic method; Frequency spectrum; Leakage; Gas pipelines	Rui Xiao	School of Civil Engineering, Tongji University, China
12:00-12:15	VIBRATION CONTROL OF A TRACKED VEHICLE DRIVER SEAT VIA MAGNETORHEOLOGICAL DAMPER	Wael Ata	Staff Member in Mechanical Engineering Department
12:15-12:30	Experimental methods of radiation hardness research of ITER Si photodiode array	Chaozhi Li	University of Science and Technology of China
12:30-12:45	A Novel Highly Reliable and Low-power Radiation Hardened 14T SRAM bitcell design	Dianpeng Lin	Shanghai Institute of Microsystem and Information Technology
12:45-13:00	Applications of coherent quantum control on	Wei Huang	Guilin University of

	waveguide coupler and THz integrated chip		Electronic Technology, China
13:00-13:15	Forest-Fire Recognition by Sparse and Collaborative Subspace Clustering	Zhen Ye	Chang'an University
Poster	Monte Carlo simulation of echo signal in airborne laser underwater detection	Xiongfei Zou	Civil Aviation Flight university of China
Poster	Simultaneous measurement of curvature and temperature based on a single fiber Bragg grating	Xuewen Shu	Huazhong University of Science and Technology, Wuhan National Laboratory for Optoelectronics,

Energy Engineering: Technical Session

Session Chair:

Tokyo Room (东京厅), 3rd Floor, Conference Building 14:00-17:00, Saturday Afternoon, December 7, 2019

ID	Paper Title	Author	Affiliation
14:00-14:45	Parameters Optimization for Electrocoagulation/ Flotation Process in Removal of Acid Red 14 with Mesh Stainless Steel Electrodes	Prof. Hossein Ganjidoust	Tarbiat Modares University, Iran
14:45-15:30	TBD	Tao Ma	Shanghai Jiao Tong University
15:30-15:50	**Coffee Break**		
15:50-16:10	Numerical studies of divided aperture techniques in confocal system	Haonan Lai	Ulinkcollege
16:10-16:30	Development and Performance Evaluation of Self-Generating Enhanced Foam water plugging system	Liu Chang	School of Petroleum Engineering, China University of Petroleum
16:30-16:50	Mechanical behavior and microstructure deformation of membrane and catalyst layer of PEMFC	Cong Feng	Tongji University
Poster	ffect of Oxygen Addition on Structural, Optical and Morphological Properties of	Na-Fu Wang	Department of Electronics, Cheng

	Ultrathin ZnO Films Deposited by RF Magnetron Sputtering		Shiu University, Kaohsiung, Taiwan
Poster	The method of testing for asbestos in electronic and electric products through polarizing microscope and X-ray diffraction	Hongwei Wang	Chinese Academy of Inspection and Quarantine
Poster	Application and Practice of High-precision Solar Resource Monitoring Technology in Photovoltaic Power Plant Area	Rong Zhou	China Renewable Energy Engineering Institute, Beijing, China

Part IV Technical Sessions Abstracts

Biomedical & Life Sciences

ID: CMVI2019_01001

Title: Variations in Hepatitis B virus genome and their importance on disease progression

Name: Ahmed A. Al-Qahtani

Affiliation: Department of Infection and Immunity, Research Centre, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabi

Email: aqahtani@kfshrc.edu.sa

Abstract:

Hepatitis B virus (HBV) is a widespread human pathogen causing chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma (HCC). HBV possesses a partially double-stranded DNA genome organized into four overlapping genes that encode four proteins, including the core protein, required to make the capsid, the viral envelope, the reverse transcriptase, and the X protein. HBV genome is characterized by considerably high rate of mutations suggested to be associated with disease severity and increasing drug resistance. Several mutations at different positions in HBV genome were shown to be correlated with liver cirrhosis and HCC. For example, mutations in the HBx gene, including I127T, V131I, H94Y, K130M and F132Y/I/R, were found to be significantly distributed in patients with advanced liver complications. Also, genetic variations at the precore/core were also linked to disease severity and liver abnormalities. Such variations include precore mutations, W28* and G29D, and core mutations, F24Y, E64D, E77Q, A80I/T/V, L116I, and E180A. Some of these mutations are located in regions suggested to actively interact with the immune system. Therefore, such dynamic genetic changes are believed to be used by the virus to counteract the immune system attack and survive within host cells. Also, viral genetic variations are suggested to enhance the functions of viral proteins to be more effective in viral replication and life cycle. In conclusion, genetic mutations in HBV genome can be useful in predicting the clinical outcome of and may serve as early clinical markers of disease severity and liver advanced failure.

ID: CABMB2019_10010

Title: Phosphorylation of AMMECR1at Serine16 is not essential for its nuclear localization

Name: Huamin Zhou

Affiliation: Xiamen University

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Abstract:

AMMECR1 is a critical gene in the pathogenesis of AMME syndrome. But, little is known about how AMMECR1 is regulated. Here, we showed that many human cell lines expressed AMMECR1. With Phos-tag SDS PAGE analysis, we demonstrated that AMMECR1 was constitutively phosphorylated at Ser16. AMMECR1 was localized in the nucleus. Mutation of Ser16 to alanine did not affect its nuclear localization. The homologs of AMMECR1, PAC688.03c and MTH857, were also nuclear proteins, but they were not phosphorylated when tested in HeLa cells. Therefore, AMMECR1 and its homologs might have atypical nuclear localization sequences.

ID: CABMB2019_10001

Title: Matrix Softening Induces Inflammatory Signals of Endothelial Cells

Name: Weicong Chen

Affiliation: Shanghai Jiao Tong University

Email: chenwc1993@foxmail.com

Abstract:

Vascular diseases such as atherosclerosis involve the change of the rigidity in the blood vessel wall. There is evidence that the changes in the blood vessel rigidity may affect the various functions of the cells in the

blood vessel, including endothelial cells (ECs) and the smooth muscle cells. On the other hand, blood vessel-on-a-chip has become an emerging research field for disease modeling. However, the effect of material rigidity on blood vessel remodeling is not well understood. Hereby, an in vitro culture system with the culture substrates matching the rigidity of vessel wall mimicking the condition of healthy (normal) or lipid deposition (soft) were prepared. The stiffness of the substrates was confirmed by atomic force microscope. although no significant difference was observed in EC morphology, the expression levels of the pro-inflammatory cytokines, including interleukin 6 (IL6), tumor necrosis factor α (TNF-α) and interleukin 1β (IL1β), were dramatically induced by soft substrate. Consistently, the inflammation-related JNK signaling was also activated. In addition, the expression level of microRNA-146a (miR-146a) was significantly decreased. Accordingly, mRNA expression level of TNF receptor associated factor 6 (TRAF6), the direct target of miR-146a, was significantly increased. In summary, these findings provide new insight into the matrix rigidity effect on ECs; while engineering the blood vessel model in vitro, matrix with proper rigidity can be carefully tailor to mimic ECs either in a quiescent or an inflammation state.

ID: CABMB2019_10003

Title: Transcriptomic profiling of microglia and astrocytes throughout aging

Name: Pan Jie

Affiliation: Biomedical Research Institute, Shenzhen Peking University - The Hong Kong University of Science and Technology Medical Center

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Abstract:

Activation of microglia and astrocytes, a prominent hallmark of both aging and Alzheimer's disease (AD), has also been suggested to contribute to aging and AD progression. However, the underlying cellular and molecular mechanisms are largely unknown. Hence, to address this issue, we performed RNA-seq in microglia and astrocytes freshly isolated from Wild-type(WT)/APP-PS1(AD) mice brains across the lifespan to analyze the longitudinal genes expression profile. Our results have shown that, compared to the young adult mice (2-month old), a set of age-related genes in microglia and astrocytes (termed age-up or age-down) showed consistent up- or down-regulation from 4 months onwards. Further bioinformatic analysis revealed that Age-up genes in microglia are associated with inflammatory response, while those in astrocytes include well-known AD risk genes, synaptic transmission or elimination-associated genes and peptidase inhibitors. Interestingly, in the late onset of AD, most of those detectable transcripts are perturbed in both microglia and astrocyte, regardless of their cellular identities. Overall, our RNA-seq data provides a valuable resource for future explorations of the role of microglia and astrocytes in aging and Aβ induced AD pathologies.

ID: CABMB2019_01012

Title: Response of the rhizosphere fungi community diversity and structure of massion's pine inoculating with Suillus luteus in Mining area

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Abstract:

The MiSeq high-throughput sequencing technique, targeting the V4 region of the fungi 18S rDNA gene, was used to investigate the fungi community structure and the links between the microbial community and soil environmental physicochemicals characteristic. The present study was aimed to assess the rhizosphere fungi community composition of Pinus massoniana in lead-zinc mining area of Suxian district, Chenzhou city, Hunan Province. The experiment were randomly divided into three groups: massion's pine inoculated with Suillus luteus, massion's pine inoculated without Suillus luteus, and bulk soil as control. The results showed that the richness and diversity of fungi in

rhizosphere soil were significantly higher than bulk soil ($p < 0.05$), but there was no significant difference between rhizosphere soils inoculated with and without ectomycorrhizal fungi. The rhizosphere fungi belong to 6 phylum, 25 classes, 65 orders, 115 families and 150 genera and the dominant phyla were Chytridiomycota (50.49%), Ascomycota (38.54%), and Basidiomycota (9.02%). The LEfSe and heatmap analysis showed that the relative abundance of Suillus, Paraglomus, Agaricus, and Tulasnella were the highest with ectomycorrhizal fungi. RDA analysis showed that the community structure significantly changed with ectomycorrhizal fungi, which was closely related to SWC, C/N, pH, AK and soil enzyme. All together, the inoculation of ectomycorrhizal fungi changed inhabit environment of microorganisms and the dominant fungi in soil, which provided a screening of keystone in the heavy metal-contaminated mining area.

Keywords：Heavy metals; Fungi community; Plant’s rhizosphere; Suillus luteus

ID: CABMB2019_10005

Title: Fomitopsis pinicola collected from British Columbia, Canada has anti-proliferative activity

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Abstract:

Cancer is a generic term for several types of diseases that can be chronic and are responsible for millions of deaths worldwide. Although there has been considerable progress in modern cancer therapy research, cancer still as one of the leading causes of deaths in the world. Some conventional methods such as chemotherapy, radiotherapy and surgery were used to treat cancer, while these treatments often along with numerous side effects and limitations which make patients suffered. Hence, biological approach using natural bioactive compounds as supportive treatments in conventional cancer therapies has become more popular. Mushrooms have been used as sources of nutrition and medicine by humans for ages. Bioactive metabolites isolated from medicinal mushrooms have shown potential successes in cancer treatment as biological immunotherapeutic agents that stimulate the immune system to act against cancer cells. In Canada, there is very limited number of studies performed on the medicinal properties of wild mushrooms. In this study, wild mushroom, Fomitopsis pinicola, collected from Haida Gwaii, British Columbia was studied for its anti-proliferative activity. F. pinicola collected was subjected to sequential extraction with 80% ethanol, 50% methanol, water, followed by 5% sodium hydroxide. All four crude extracts of mushroom were assessed for their potential anti-proliferative activity against human cervical (HeLa) cancer cells. The 80% ethanol and 50% methanol extracts showed significant anti-proliferative activity. Results will be presented and discussed.

ID: CABMB2019_10007

Title: A polyU polymerase CDE-1 suppresses the production of antisense ribosomal siRNA by coupling 3'-end polyuridylation and degradation of 26S rRNA

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Abstract:

Antisense ribosomal siRNAs (risiRNAs) down-regulate pre-rRNA through the nuclear RNAi pathway in Caenorhabditis elegans. However, the biogenesis and regulation of risiRNAs remain obscure. Previously, we showed that 26S rRNAs are uridylated at 3'-ends by an unknown terminal polyuridylation polymerase before the rRNAs are degraded by a 3' to 5' exonuclease SUSI-1(ceDIS3L2). There are three polyuridylation polymerase, CDE-1, PUP-2, and PUP-3, in C. elegans. Here, we found that CDE-1 is specifically involved in suppressing risiRNA production. CDE-1 localizes to perinuclear granules in germline and uridylates both Argonaute-associated 22G-RNAs and 26S rRNAs at 3'-ends.

Immunoprecipitation followed by mass spectrometry (IP-MS) uncovered that CDE-1 interacts with SUSI-1(ceDIS3L2). Consistently, both CDE-1 and SUSI-1(ceDIS3L2) are required for the inheritance of RNAi. Therefore, this work identified a surveillance machinery of rRNAs by coupling terminal polyuridylation and degradation.

ID: CABMB2019_01002

Title: LC Domain Mediated Coalescence Is Essential for Otu Phase Separation and Enzymatic Activity

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Abstract:
In eukaryotic cells, RNA-binding proteins (RBPs) interact with RNAs to form ribonucleoprotein complexes (RNA granules) that have long been thought to regulate RNA fate or activity. Emerging evidence suggests that some RBPs not only bind RNA but also possess enzymatic activity related to ubiquitin regulation, raising important questions of whether these RBP-formed RNA granules regulate ubiquitin signaling and related biological functions. Here, we show that Drosophila Otu binds RNAs and coalesces to membrane-less biomolecular condensates via its intrinsically disordered low-complexity domain, and coalescence represents a functional state for Otu exerting deubiquitinase activity. Notably, coalescence mediated enzymatic activity of Otu is positively regulated by its bound RNAs and co-partner Bam. Thus, regulated biomolecular condensates may represent a mechanism that controls dynamic enzymatic activities.

ID: CABMB2019_01016

Title: Sequencing and Analysis of Transcriptome on Leaf of Swida wilsoniana of the Woody Oil Plant

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Abstract:
Illmina HiSeq sequencing platform technology was used to sequence and analyze the leaves of Swida wilsoniana, and 36839 unigene was obtained by assembly. Compared with databases NR, String, Swissprot, KEGG, et al. 25 857 unigene were annotated from 36893 unigene, and the annotation rate was 70.09%. The number of unigene annotated in the databases Pfam,NR,String, Swissprot, KEGG, KOG, GO was 14 776, 25 758, 13 761, 16 900, 10 575, 9 656 and 15286, respectively.The annotation results showed that, as compared to other species, the sequence of the Swida wilsoniana has the most homologous sequence with Vitis vinifera. GO and KOG divided them into three major categories of 58 groups and three functional categories; according to the KEGG, 13 114 unigene was involved in the 33 metabolic pathways. The SSR of 36 839 unigene was detected by software MISA, a total of 10,828 SSR loci were found in 8945 unigene.The length of SSR was in the range of 10 to 329 bp, and the average length was 22.69 bp. The highest abundance of SSR is dinucleotide, accounting for 58.07% of all SSR, followed by mononucleotide and trinucleotide, accounting for 27.02% and 13.36% of the total SSR, respectively. Through the sequencing of leaf transcription group, a large number of gene sequences were obtained, and the general expression of Swida wilsoniana gene was understood. At the same time, it provided a data reference for the development and utilization of Swida wilsoniana ， molecular biological markers , genome sequencing and assembly of Swida wilsonian in the future.It also provides a basis for the follow-up research on molecular biology, the construction of core collection construction and directional breeding of Swida wilsonian.

Keywords Swida wilsoniana, Transcriptome, Sequencing, Gene annotation, SSR

ID: CABMB2019_10006

Title: Deficiency of apoptosis-stimulating protein 2

of p53 protects mice from acute hepatic injury induced by CCl4 via autophagy

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Abstract:
BACKGROUND: Apoptosis-stimulating protein 2 of p53 (ASPP2) has a variety of biological function, and is involved in cellular apoptosis, autophagy and inflammatory reaction. However, the role of ASPP2 in acute hepatic injury remains unclear.
METHODS: We established an animal model of acute hepatic injury by intraperitoneal injection of CCl4. The expression profile of ASPP2 was measured in wild type (ASPP2+/+) mice with acute hepatic injury induced by CCl4. Hepatic pathological changes and liver function, apoptosis, inflammation and autophagic levels were measured in ASPP2+/+and ASPP2 haploid deletion (ASPP2+/−) mice with acute hepatic injury, respectively. After 3-methyladenine (3-MA) treatment, indicators of hepatic injury were observed in ASPP2+/+and ASPP2+/mice with CCl4 injection.
RESULTS: During the development of acute hepatic injury, ASPP2 expression significantly upregulated at 24 h and 48 h after CCl4 injection. ASPP2 haplotype deletion protected against acute hepatic injury, and this was mainly reflected in decreased ALT and AST levels, less hepatic tissue hemorrhage and necrosis, and reduced cellular inflammation and apoptosis in ASPP2+/− mice compared with ASPP2+/+ mice with acute hepatic injury. ASPP2 haploid deletion activates autophagy in mice with acute hepatic injury, and protects mice from acute hepatic injury via the autophagic signal pathway.
CONCLUSION: ASPP2 haplotype deletion protected mice against acute hepatic injury through autophagy activation, which inhibited inflammation and apoptosis in acute hepatic injury.

ID: CABMB2019_10008

Title: Single-Cell RNA Sequencing Analysis Reveals Sequential Cell Fate Transition during Human Spermatogenesis

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Abstract:
Spermatogenesis generates mature male gametes and is critical for the proper transmission of genetic information between generations. However, the developmental landscapes of human spermatogenesis remain unknown. Here, we performed single-cell RNA-seq analysis for 2,854 testicular cells from donors with normal spermatogenesis and 174 testicular cells from one nonobstructive azoospermia (NOA) donor. A hierarchical model was established, which was characterized by the sequential and step-wise development of three spermatogonia subtypes, seven spermatocyte subtypes, and four spermatid subtypes. Further analysis identified several stage-specific marker genes of human germ cells such as HMGA1, PIWIL4, TEX29, SCML1, and CCDC112. Moreover, we identified altered gene expression patterns in the testicular somatic cells of one NOA patient via single-cell RNA-seq analysis, paving the way for further diagnosis of male infertility. Our work allows for the reconstruction of transcriptional programs inherent to sequential cell fate transition during human spermatogenesis and has implications for deciphering male-related reproductive disorders.

ID: CABMB2019_10009

Title: Aurora Kinase inhibitor Tozasertib Suppresses the Mast Cell Activation In Vitro and In Vivo via Downregulating Cellular NF-κB and MAPK Pathways

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Abstract:
Purposes： Mast cells (MCs) are important in allergic

reactions since these cells' activation provokes the synthesis, degranulation and release of inflammatory mediators, inflammatory cytokines and chemokines. Aurora Kinase inhibitor Tozasertib is designed as the anti-cancer drug to possess the property of inhibiting cell growth and inflammation, but its regulatory effect on mast cells and allergic responses remains unknown. Here, we assess the anti-allergic effects and the underlying molecular mechanisms of Tozasertib on controlling mast cell activation using in vitro and in vivo models.

Methods: Effect of Tozasertib on mast cell degranulation was determined by measuring the release of β-hexosaminidase or histamine in the mast cell line RBL-2H3 or mouse bone marrow-derived mast cells (BMMCs) stimulated with DNP-IgE/HSA treatment or human mast cell line LAD2 activated with phorbol-12-myristate 13-acetate plus calcium ionophore (PMACI) treatment. Additionally, morphological change of mast cells was determined by toluidine blue staining and FITC-phalloidin staining. Western blotting assay was performed to detect the expression of the key molecules of nuclear factor-κB (NF-κB) and mitogen-activated protein kinases (MAPK) signaling. Besides, the murine IgE-mediated Passive Cutaneous Anaphylaxis (PCA) model and ovalbumin-induced Active Systemic Anaphylaxis (ASA) were used to determine the anti- allergic effects of tozasertib in vivo.

Results: Tozasertib significantly decreased FcεRI or PMACI-mediated degranulation in RBL-2H3 cells and BMMCs or LAD2 cells, evaluated by determine the levels of β-hexosaminidase and histamine. Similarly, tozasertib also prevented morphological changes in MCs, such as inhibiting of particle release and reorganizing inhibition of F-actin. In addition, tozasertib markedly diminished the expression levels of p-NF-κB p65, p-Erk1/2, p-p38 and p-JNK, indicating that tozasertib could inhibit the signaling pathway of MC activation. Furthermore, tozasertib dose-dependently attenuated the IgE/Ag induced PCA reaction, displaying reduced the content of Evans blue staining. Similarly, tozasertib reduced body temperature levels and serum histamine levels in ASA mice challenged with OVA.

Conclusions: We found that aurora kinase inhibitor Tozasertib suppressed the mast cell activation in vitro and in vivo. Thus, Tozasertib may be a potential drug for targeting mast cell activation to treat allergic diseases or mastocytosis.

ID: CB2019_10006

Title: Phytosociology – the useful tool of assessment of past and future human impact on plants and forest ecosystems

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Abstract:
The aim of the research was to find an answer to the question whether the floristic-phytosociological characteristics of forest communities described in the mid-twentieth century in the Zielonka Experimental Forest (Poland) changed, and if so, what were the reasons for these changes and what are their environmental and economic consequences. The basis of the research was a comparison of descriptions of plant communities drawn up in 1957-1961, with their state for 2010-2017. The study has shown recession of 5 plant communities and a significant decrease in the number of plant species and lichens. The reasons for the disappearance of some plant communities can be seen in the natural or artificial regeneration of pine on sandy habitats, which evolving towards richer communities. The disappearance of xero-thermophile oak woods has two main causes: a natural one, a consequence of regeneration towards oak-hornbeam woods after the anthropogenic phenomena responsible for their management and anthropogenic disturbance, related to planting beech trees. The last case has been described more broadly, taking into account both the positive and negative role of changing the floristic composition of the forest ecosystem.

ID: CB2019_10100

Title: A Study on the Change Characteristics of CO2, CH4 and N2O Emission Fluxes in Ebinur Lake's High Salinity Wetland Soils of under Different Typical Plant Communities

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Abstract:

In order to study the temporal and spatial changes of CO2, CH4, and N2O emissions from high salinity wetland soils in arid regions and the factors that influence such changes, Ebinur Lake wetland was used as the case study area. Static chamber-gas chromatography was adopted in measuring the change characteristics of CO2, CH4, and N2O fluxes at different spatial and temporal scales over a period, starting from August 2015 to January 2017. Afterwards, factors influencing changes in greenhouse gas emission fluxes were analyzed. The results show that CO2 and N2O emission fluxes in Ebinur Lake's high salinity wetland soil change with the season, the maximum values appearing during summer and the minimum values appearing during winter, and that CO2 and N2O exhibit weak absorption flux during winter. The absorption flux of CH4 in the soil during summer was significantly higher than in other seasons. The maximum annual average CO2 and N2O emission fluxes of Ebinur Lake wetland appeared in the haloxylon ammodendron-tamarix chinensis community in the northwest, which were 59.40±75.26μg·m-2·h-1 and 8.43±9.70μg·m-2·h-1 respectively; while the maximum annual average CH4 absorption flux appeared in the southeastern populus euphratica community, which was 49.69±5.0μg·m-2·h-1. After analysis of environmental factors, it was found that soil temperature, air temperature and humidity, and soil organic matter are the main factors affecting the CO2, CH4, and N2O emission fluxes in Ebinur Lake's high salinity lake wetland soil. Over a period of 100 years, the comprehensive warming potentiality of the soil under different typical plant communities is as follows: the haloxylon ammodendron-tamarix chinensis community (3618.19 g·m-2)> the haloxylon ammodendron community (2421.96 g·m-2)> the populus euphratica community (1579.77 g·m-2)> the phragmites australis community (546.83 g·m-2). In summary, Ebinur Lake's high salinity wetland soil is generally the source of greenhouse gas emissions, which means that it contributes to global warming.

Keywords: Ebinur Lake; Lake Wetlands; Greenhouse Gases in Soils; Comprehensive Warming Potentiality

ID: CB2019_10002

Title: Preliminary Analysis of Sapindus mukorossi Extracts from Different Sources for their Antifungal Potential against Forest Fungi

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Abstract:

In this present study, seeds of Sapindus mukorossi, a medicinal plant of family Sapindaceae, collected from different sources namely, Dehradun and Gyarahdevi (Uttarakhand) and Nainatikker (Himachal Pradesh), were evaluated for their antifungal potential on the basis of inhibitory concentration 50 (IC50). Petroleum ether and chloroform extract of fruit pericarp from three sources of soap nut were tested against five forest fungi viz. Alternaria alternata, Phoma sp., Phomopsis dalbergiae, Fusarium oxysporum, and Trichoderma piluliferum using poisoned food technique. Both the extracts were screened at four concentrations of 0.5, 0.1, 1.5 and 2.0 per cent. In our screening, we have found that chloroform extract of all three sources achieved IC50 at all concentrations against Phoma sp. and Phomopsis dalbergiae whereas petroleum ether pericarp extract of any of the source could not achieve IC50 against any of the fungi. On the basis of the above analysis, it can be concluded that though secondary metabolites (saponins) of soap nut tree have many useful physiochemical and biological effects but

it does not contain significant and exclusive biological activity against forest fungi.

Keywords Antifungal activity, IC50, Pericarp, Poisoned food technique

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ID: CABMB2019_10004

Title: CircTulp4 functions in Alzheimer's disease pathogenesis by regulating its parental gene, Tulp4

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Abstract:
Alzheimer's disease (AD)—one of the most common neurodegenerative diseases worldwide—impairs cognition, memory, and language ability and causes dementia. However, AD pathogenesis remains poorly elucidated. Recently, a potential link between AD and circular RNAs (circRNAs) has been uncovered, but only a few circRNAs that might be involved in AD have been identified. Here, we systematically investigated circRNAs in the APP/PS1 model mouse brain through deep RNA-sequencing. We report that circRNAs are markedly enriched in the brain and that several circRNAs exhibit differential expression between wild-type and APP/PS1 mice. We characterized one abundant circRNA, circTulp4, derived from Intron1 of the gene Tulp4. Our results indicate that circTulp4 predominantly localizes in the nucleus and interacts with U1 snRNP and RNA polymerase II to modulate the transcription of its parental gene, Tulp4, and thereby regulate the function of the nervous system and participate in the development of AD.

ID: CB2019_10011

Title: Lanosterane triterpenes with anti-inflammatory activities from the fruiting bodies of Inonotus obliquu

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Abstract:
Inonotus obliquus is a medicinal fungus that grows in birch trees. Widely distributed in Europe, Asia and North America, the mushroom has been used in folk cancer treatments in Russia and western Siberia for four centuries [1]. In recent years, the extract of this fungus has been reported to contain a variety of triterpenes, mainly lanogonane triterpenes, which have anti-tumor, anti-oxidation and anti-inflammatory activities [2-5]. In this study, eight lanosterane triterpenes were isolated from the ethyl acetate part of the fruiting body of Inonotus obliquus in northern Heilongjiang province. The anti-inflammatory activity of BV-2 induced by LPS showed that all the compounds had significant anti-neuritis activity, and the IC50 value was shown as Table 1.

ID: CB2019_10012

Title: Bioactive Aromadendran Sesquiterpenes from the fruits of Pittosporum tobira

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Abstract:

Nine Aromadendran Sesquiterpenoid glycosides A-I (1-9) were isolated from the fruits of Pittosporum tobira ， including four novel and five known products.Their planar structures and relative strerochemistry were elucidated by analyzing comprehensive 1D and 2D NMR, and HRESIMS. Some of these compounds exhibited remarkable inhibitory effects against nitric oxide (NO) production with IC50 values ranging from 2.1-10.5 μ M, comparable to that of the positive control.

ID: CB2019_10017

Title: Thiodiketopiperazines with Tyrosinase Inhibitory Activity from The Endophytic Fungus Phaeosphaeria fuckelii

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Abstract:

Phaeosphaeria fuckelii, an endophytic fungus associated with Phlomis umbrosa, produced four new thiodiketopiperazines named phaeosphaones A−D (1−4), featuring a rare β-(oxy)thiotryptophan motif, a new natural product, phaeosphaone E (5), along with three known analogues (6−8). The structures of these compounds were elucidated by extensive spectroscopic data analysis, and their absolute configurations were determined by single-crystal X-ray diffraction and ECD calculations. Compounds 4, 6 and 8 showed inhibitory activity against mushroom tyrosinase with IC50 values of 33.25, 31.66 and 28.46 μM, which were more potent than that of the positive control kojic acid (40.37 μM).

ID: CB2019_10018

Title: Study on desensitization of raw lacquer and its antibacterial activity

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Abstract:

The extraction process of Pingli small wood lacquer was determined by single factor test and orthogonal test with edible alcohol as solvent. The reproducibility test verified the optimal extraction process, and established two lines of immunoglobulin desensitization route to urushiol and amino acid to desensitize urushiol. Rat skin test and human patch test were used to test the sensitization of urushiol desensitization. At the same time, the bacteriostatic activity of urushiol before and after desensitization was measured, which provided technical support for the natural plant-type bacteriostatic agent with urushiol as the main material.The results showed that the optimum extraction process of urushiol was extraction temperature 60 °C, ratio of material to liquid 1:5, extraction time 10 min, extraction 4 times, urushiol yield 72.9%; immunoglobulin and urushiol and immunoglobulin When the protein volume ratio is 1:3, the desensitization rate is 99%.When the volume ratio of urushiol to amino acid is 1:5, the desensitization rate is 100%, and the desensitization rate increases with the ratio of the ratio of urushiol to immunoglobulin.Desensitized urushiol has a certain inhibitory effect on the growth concentration of Staphylococcus aureus, Escherichia coli, Shigella and Salmonella. The antibacterial effect is Staphylococcus aureus>Escherichia coli>Shigella>Salmonella.The inhibition rate in 24 hours reached 86.96%, 84.21%, 84.08%, and 86.17%, respectively, and there was no significant difference with the bacteriostatic rate of urushiol stock solution.At the same time, the antibacterial properties of lacquer phenol before and after desensitization were compared. The results showed that there was no difference in antibacterial ability. The anti-allergenic urushiol inhibited the individual pathogenic bacteria more than the urushiol stock solution.The octagonal and cinnamyl alcohol extracts were combined with desensitized urushiol, and the antibacterial test, sensitization test and physical and chemical components were tested in accordance with the national standard. The next step was to develop an industrial and household bacteriostatic agent.

ID: CB2019_10013

Title: Bioactive Cassane Diterpenes from the stem of Ceasalpinia pulcherrima

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Abstract:

The Caesalpinia genus belongs to the Fabaceae family and comprises approximately 100 species that are commonly distributed in China, Thailand, Vietnam and other countries of tropical and subtropical locality [1]. Caesalpinia pulcherrima (L.) Swartz, locally known as 'Hang Nok Yung Thai', is a large perennial shrub or small tree, that is, widely distributed in tropical areas and has been used as an ornamental plant[2]. As regards its biological activities, C. pulcherrima exhibits cytotoxic, antitubercular, antibacterial, and antifungal activities[3] and is also active against DNA repair-deficient yeast mutant[4]. Five new cassane diterpenes, caesalpulcherrins A-E (1-5), one new natural product (6), and four known ones (7-10) were isolated from the stem of Ceasalpinia pulcherrima. Their structures including relative stereochemistry were elucidated on the basis of comprehensive 1D and 2D NMR, and HRESIMS. Most of these compounds displayed significant cytotoxicity against Human brain glioblastoma cell line U87 with IC50 values of 10.7-36.5 μM. Furthermore, their antifeedant activity against the generalist insect herbivore, Mythimna separate and Plutella xylostella are also described.

ID: CMVI2019_10002

Title: Construction of anaerobic gut-on-a-chip model and its application for Clostridium difficile infection study

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Abstract:

Clostridium difficile (C. difficile) is a spore forming, Gram-positive, obligate anaerobic bacillus. Historically, C. difficile infection (CDI) the main cause of infectious diarrhea in healthcare settings after antibiotic treatment. However, it was reported that the proportion of C. difficile infection occurring in the community increased in the past decade[1]. The pathogenesis, host-bacteria interaction and treatment of CDI has attracted more and more attention of investigators in the worldwide range.

Microfluidic based gut-on-a-chip is an emerging platform which enables culture of human intestine epithelial cell and simulation of intestinal microenvironment such as liquid flow and peristalsis[2]. Due to its unique advantages of flexible controlling of environment conditions, gut-on-a-chip has been used for the study of several kinds of bacteria and virus infection[3]. Here, we established an anaerobic gut-on-a-chip system and used it for the study of CDI. The chip was composed of three layers that the top channel was used for bacteria loading and culture under anaerobic condition, the bottom channel was used for cell culture medium flow to maintain cell growth, while human intestinal epithelial cell grow on the middle porous PDMS membrane. The results showed that the cells and C. difficile both grow well on the chip, demonstrating the utility of the gut-on-a-chip system for CDI infection.

ID: CMVI2019_10003

Title: Investigation of bacteria cell-size homeostasis mechanism under environmental perturbation using mother machine

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Abstract:

In order to maintain the stability of growth under different environment conditions, bacteria need to regulate the cell size precisely. Until now, the

mechanism of cell size regulation under environmental stress (such as low nutrition, antibiotic exposure) is still not clear. The rise of microfluidic single cell technology provides a new opportunity for this study, due to the capability of long-term and high-resolution monitoring of cell size changes. Based on this technology, our group has found that cell size homeostasis follows the noisy linear map model, which states that larger initial cells tend to divide earlier, while smaller initial cells tend to divide later，bacteria in a colony exhibit linear negative feedback property with noisy trait. According to the previous study, we predict that environmental stress will weaken the bacteria's ability of regulating cell size, while the noise distribution of cell size will be enlarged, but the cell size homeostasis mechanism will still inherit the basic property of noisy linear map model. In this project, we will investigate the relationship between environmental stress and cell size homeostasis based on improved microfluidic single cell technology from the perspective of quantitative biology, and validate our scientific assumptions. The completion of this project will not only provide more theoretical and experimental evidences for molecular mechanism of cell size regulation, but also provide a new feasible way to solve the bacteria antibiotic resistance problem.

Physics Sciences

ID: APSS2019_10012

Title: Remnants of first stars for gravitational wave sources

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Abstract:
Using our population synthesis code, we found that the typical chirp mass of binary black holes (BH-BHs) whose origin is the first star (Pop III) is ~30Msun with the total mass of ~60Msun so that the inspiral chirp signal as well as quasi normal mode (QNM) of the merging black hole are interesting targets of LIGO,VIRGO, and KAGRA (Kinugawa et al.2014 and 2016). The detection rate of the coalescing Pop III BH-BHs is ~ 180 events/yr in our standard model. Furthermore, we found that the chirp mass has a peak at ~30Msun in most of parameters and distribution functions (Kinugawa et al.2016). This result predicted the gravitational wave events like GW150914 and LIGO paper said 'recently predicted BBH total masses agree astonishingly well with GW150914 and can have sufficiently long merger times to occur in the nearby universe (Kinugawa et al. 2014)' (Abbot et al. ApJL 818,22 (2016)).Thus, there is a good chance to check indirectly the existence of Pop III massive stars by gravitational waves.

ID: LOC2019_10003

Title: High resolution photoacoustic tomography system for whole mouse brain imaging based on full-ring ultrasound array

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Abstract:
Photoacoustic tomography (PAT) is an emerging macroscale biophotonic imaging modality due to its combining the advantage of deep penetration depth of ultrasonic imaging and the high spatial resolution of optical imaging. Full-ring array based PAT that have a complete 360-degree view of photoacoustic signals without sample rotation has becomes the mainstream technology, which has been successfully used in the function and structure imaging of whole mouse brain, brain tumors, and cancerous lesions in the breast et al. Due to the low central frequency of the array (≤5MHz) and low sampling rate of parallel data acquisition system (40MS/s), the spatial resolution of the previous PAT systems are limited to 100~200 μ m. On the basis of the previous prototype, a high resolution of full-ring PAT system for whole mouse brain imaging has been developed. The system features a 100MS/s parallel data acquisition system and a 10MHz 256-element ultrasound transducer ring array, achieves 1.6ms

acquisition time and 88 μ m lateral resolution over the field of view of 25 × 25mm2. The potential applications of the system were obviously demonstrated by mapping the different depth of the mouse brain structure and vasculature in vivo. We also prove that the system has the ability to provide precision imaging of mouse ' s subcutaneous microvasculature, cerebral ischemia, and intracerebral foreign-body. The experimental results indicate that this PAT system has the potential for becoming a high frame rate and high resolution approach for the function and structure imaging of whole mouse brain.

ID: LOC2019_10005

Title: Forest-Fire Recognition by Sparse and Collaborative Subspace Clustering

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Abstract:
Traditional forest-fire recognition based on the characteristics of smoke, temperature and light fails to accurately detect and respond to early fires. By analyzing the characteristics of flame, the methods based on aerial image recognition have been widely used, such as RGB-based and HIS-based methods. However, these methods are susceptible to background factors causing interference and false detection. To alleviate these problems, we investigate two subspace clustering methods based on sparse and collaborative representation, respectively, to detect and locate forest fires. Firstly, subspace clustering segments flame from the whole image. Afterwards, sparse or collaborative representation is employed to represent most of the flame information in a dictionary with l1-regularization or l2-regularization term, which results in fewer reconstruction errors. Experimental results show that the proposed SSC and CSC substantially outperform the state-of-the art methods.

ID: LOC2019_10002

Title: The precise analytical modeling and measurement of the fractional thermal loading in a laser medium

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Abstract:
Thermal loading in solid-state lasers has been investigated for many years. For laser media under pumping, the heat can be generated via subsequent multi-phonon relaxation of stimulated emission, and the fluorescence process. Likewise, the interionic up-conversion processes, including energy transfer up-conversion (ETU), exited state absorption (ESA) and so on, can also contribute to heat generation via multi-phonon relaxation. Fractional thermal loading is defined as the ratio of the thermal energy generated in the laser medium to the absorbed pump energy. Thermal loading leads to thermal effects, including thermal lensing, thermally induced diffraction losses, thermal depolarization and thermal fracture. Therefore, thermal loading needs to be thoroughly understood and characterized for the investigation and design of solid state lasers. A number of methods have been developed to determine thermal loading, such as the calorimetric method, interferometers, beam deflection, measurement of quenching pump power and thermally induced depolarization of the second-harmonic output. The ETU and ESA processes can affect the laser dynamics of solid-state lasers (especially Nd-doped and Er-doped lasers) significantly, for example, by reducing the population of the upper laser level, increasing the laser threshold, degrading the laser conversion efficiency and introducing heavy thermal loading in the laser medium.
In this paper, the thermal loading fraction is investigated as a function of pump power, taking the fluorescence process, stimulated emission, the ETU process and the ESA process into account simultaneously [1]. The fraction of pump power that is deposited as heat can be determined by measuring the input current of the thermoelectric module [1]. By applying this theoretical mode and the measurement

method to a diode-end pumped Nd:GdVO4 laser at 1342 nm, the theoretical results are in good agreement with the experimental results [1].

Reference

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ID: CAVNC2019_10003

Title: NUMERICAL STUDIES OF BPF PRESSURE PULSATION IN CENTRIFUGAL VENTILATORS

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Abstract:

There is a link between pressure pulsations in the centrifugal ventilator working cavity and its noise level on blade passing frequencies (BPF) They result from non-stationary hydrodynamic interaction between the impeller flow and volute casing. Pressure pulsations depend on quality of hydraulic profiling of ventilator. The amplification of pressure pulsations can happen due to matching of frequencies of oscillations with acoustic resonance frequencies. In ventilators the length of acoustic waves can be comparable to the size of the casing. Therefore the variation of rotation speed, number of rotor blades, the fan installation in the ventilation system can substantially modify amplitudes of pressure pulsations due to the resonance inside the ventilator cavity. Various numerical studies of BPF pressure pulsation in ventilators are undertaken using the method and software package based on a representation of non-stationary motion of a compressible medium as a superposition of acoustic and vortex modes. In this case non-linear equations for unsteady vortex motion of an incompressible liquid are solved with a bigger time step. Wave equation relative to the pressure pulsations taking into account acoustic impedances on the borders of computational domain is solved by an explicit method. As a result the whole processor time for both modes of oscillations is reduced and accuracy of prediction for the acoustical mode is improved.

ID: CAVNC2019_10004

Title: Assessment of Whole-body vibration produced by machines used in processing of mineral raw materials

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Abstract:

At workstations associated with mineral raw materials processing mechanical vibrations acting on a worker through the feet or through the pelvis, shoulders, or sides are called whole-body vibration (WBV). Prolonged exposure to vibration can lead to permanent, irreversible lesions involving primarily the skeletal system and internal human organs. Currently, the measurements of mechanical vibration generated by machinery and equipment used in the processing of mineral raw materials are usually carried out to determine and monitor their technical condition. Evaluation of whole-body vibrations on this type of workstations is not performed at all or is carried out to a very limited extent. Based on the results of the measurements carried out by CIOP-PIB, it was concluded that the researched workstations may be the cause of occupational risk. The assessment showed that vibration hazards at those workstations were classified as negligible low, low, medium or high.

ID: CAVNC2019_10005

Title: Measurements of vibration using a high-speed camera – preliminary tests

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Abstract:
In the technical diagnostics and monitoring of high dynamic processes high-speed cameras are getting wider application. Recorded images sequence analysis of an object position makes possible to study also the oscillating movement. In this paper results of some exploratory research of test vibration signals are presented. The aim of the study was to examine the possibility of applying high-speed camera to vibration measurements in the frequency range up to 1000 Hz. The results of recorded image analyses of oscillating movement were compared with results of vibration acceleration measurements obtained using laser and piezoelectric transducers. Based on the achieved results, some limitations and conditions for the application of the high-speed camera used for vibration analyses have been identified.

ID: CAVNC2019_10000
Title: Acoustic method; Frequency spectrum; Leakage; Gas pipelines
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Abstract:
Leak detection of gas pipelines has attracted extensive attention in recent years be-cause such a leak could result in significant damage to society. This paper proposes a frequency spectrum model of leak noise in gas pipelines to guide the detection work and repair activities. Firstly, the proposed model is established by combining the equivalent source model and the Green's function. Then, the normal velocity spectral density and the lateral correlation length at the leak hole are further investigated to improve the model. After that, parameters of the proposed model are identified by using the laboratory experiment data. The results state that the proposed model re-veals the mechanism of leak noise generation physically and is capable of quantifying the influence of different factors, i.e., the leak size, pipe pressure and so forth, on leak noise. Therefore, it is valuable and meaningful for use in leak detection of gas pipe-lines.

ID: CAVNC2019_10001
Title: VIBRATION CONTROL OF A TRACKED VEHICLE DRIVER SEAT VIA MAGNETORHEOLOGICAL DAMPER
Name: Wael Ata
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Abstract:
Tracked vehicles are exposed to severe operating conditions during their battlefield. The suspension system of such vehicles plays a crucial role in the mitigation of vibra-tion transmitted from unevenness to vehicle hull and consequently to the crew. When the vehicles are crossing the road with high speeds, the driver is subjected to a high magnitude of vibration dose. This is because of the passive suspension system of the tracked vehicle lack the effectiveness to withstand induced vibration from irregular terrains. This paper presents vibration control of a semi-active seat suspension incor-porating Magnetorheological (MR) damper fitted to a driver seat of an amphibious tracked vehicle (BMP-1). A half vehicle model featuring the proposed semi-active seat suspension is developed and its governing equations are derived. Two controllers namely; skyhook and fuzzy logic skyhook based to suppress the vibration dose at driver's seat are formulated. The results show that the controlled MR suspension seat along with the vehicle model has substantially suppressed vibration levels at the driv-er's seat under bump and sinusoidal excitations.

ID: RERP2019_10001
Title: Experimental methods of radiation hardness research of ITER Si photodiode array
Name: Chaozhi Li

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Abstract:
In order to investigate effects of neutron damage on Si photodiode array (SPDA), we used different experimental methods, liked measuring signal response and electrical characteristics, to check its performance. As an example, we monitored array's signal response during a neutron irradiation experiment with neutron fluence of 9.89*1013 n/cm2. The fluctuation of signal response reflected its radiation hardness and recovery effect. On the other hand, results of electrical characteristics of irradiated array showed the silicon of it behaved like a relaxation-like material. Measuring results told us that after the experiment SPDA still has signal response, but resulting low energy response and high reversed current are its disadvantages for effective X-ray detection.

ID: RERP2019_10000
Title: A Novel Highly Reliable and Low-power Radiation Hardened 14T SRAM bitcell design
Name: Dianpeng Lin
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Abstract:
In this paper, based on the SEU physics mechanism reasonable layout-topology, a novel low-power and highly reliable radiation hardened memory cell (RHMC-14T) using 14 transistors is proposed to tolerate single node upset and multiple-node upset. The simulation results show that the proposed 14T cell can provide 100% fault tolerance, which is very useful for aerospace applications in rigor radiation environments. Moreover, the proposed cell has comparable or lower overheads in terms of area, access time and static power compared with previous radiation hardened memory cells.

ID: LOC2019_10006
Title: Monte Carlo simulation of echo signal in airborne laser underwater detection
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Abstract:
This paper analyzed the shortcomings and defects of the Monte Carlo simulation method in airborne laser underwater detection at home and abroad, and puts forward a new simulation idea and simulates the whole formation process of echo signals, which is of simple principles and high efficiency. We make analysis of the transmission of laser in air and through air into seawater, the transmission of laser in seawater, the reflection at the sea bottom and the transmission of laser through seawater into air. In this paper, firstly the receiver is regarded as a circular receiver above seawater, then computes the direction of photons out of seawater, finally estimate whether the photons are received by the receiver according to the direction of photons.

ID: LOC2019_10100
Title: Simultaneous measurement of curvature and temperature based on a single fiber Bragg grating
Name: Xuewen Shu
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Abstract:
In this paper, an all-fiber optics sensor which can simultaneously measure temperature and curvature is fabricated by femtosecond laser line-by-line direct-write technique. It only includes grating structure, but two effects can be observed on the optical spectrum analyzer, namely Mach-Zehnder interferometer (MZI) and fiber Bragg grating (FBG) effect, forming two corresponding interference patterns

in the spectrum. Based on different locations of the grating in fiber core, we demonstrated two different schemes for sensing test. Experimental results show that the FBG resonant dip (dip1) is insensitive to curvature, while the MZI interference dip (dip2) is sensitive to curvature, and the sensitivity is -1.42nm/m-1 for Scheme 1 and -2.39nm/m-1 for Scheme 2, respectively. For Scheme 1, the temperature sensitivities of the dip1 and dip2 are 0.010nm/℃ and -0.078nm/℃, and that of Scheme 2 are 0.009nm/℃ and -0.046nm/℃. The novel sensor will have attractive potential applications due to some of its distinct advantages, such as compact size, low fabrication cost, simple structure, high sensitivity etc.

Keywords: Femtosecond laser; Line-by-line; Fiber Bragg gratings; MZI; Fiber optics sensors.

ACKNOWLEDGMENT

We are grateful to Mr. Jiancheng Deng and Xin Liu for their help with the experiment.

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ID: MANPP2019_01005

Title: Applications of coherent quantum control on waveguide coupler and THz integrated chip

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Abstract:

In my talk, firstly, I will talk about employing coherent quantum control to design waveguide coupler. Employing counterdiabatic shortcut to adiabaticity (STA), we design shorter and robust achromatic two- and three- waveguide couplers. We assume that the phase mismatch between the waveguides has a sign flip at maximum coupling, while the coupling between the waveguides has a smooth spatial shape. We show that the presented coupler operates as a complete achromatic optical switch for two coupled waveguides and as an equal superposition beam splitter for three coupled waveguides. An important feature of our devices is that they do not require larger coupling strength as compared to previous designs, which make them easier to realize in an experimental setting. Additionally, we show that the presented waveguide couplers operate at a shorter device length and are robust against variations in the coupling strength and the phase mismatch. Secondly, I will talk about application of coherent quantum control to THz integrated chip. As the key concept in fabricating integrated device, surface plasmon- polaritons (SPPs) have been widely employed to artificially manipulate the EM waves in metallic surfaces. However, due to the highly structure-dependent resonance of SPPs, it is challengeable to develop a fixed device which can function at wide band. Here, we propose a novel broadband and robust SPPs directional coupler based

on the tri-layered curved waveguides working at terahertz (THz) frequencies, where the coupling of SPPs between the adjacent waveguides can be modeled with coupled mode theory (CMT). By introducing the stimulated raman adiabatic passage (STIRAP) quantum control technique, we achieve the complete transfer of SPPs from the input to the output waveguides in the range of 0.9 - 1.3 THz, and even considering the propagation loss, the transfer rate is still above 70%. Furthermore, the performance of our device is eminently robust because of its insensitivity to the geometry of structure and the wavelength of SPPs. As a result, our device can tolerate defect induced by fabrication processing and manipulate THz waves at broadband. This finding provides a new theoretical guideline in promoting THz on-demand applications, which is of significance in developing integrated THz devices.

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Energy Engineering

ID: CEES2019_10002
Title: Numerical studies of divided aperture techniques in confocal system
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Abstract:
This paper performs a numerical study of the imaging process in confocal microscopy. We simulate the imaging result using Fresnel diffraction formula. We also consider the divided aperture technique in confocal system. Different aperture shapes were varied to achieve best performance in terms of resolution and integrated intensity. Here, the D-shaped achieves the best performance in x-axis resolution, while the annular aperture shape is the worst for integrated intensity. We propose using different aperture shapes for various biomedical applications.

ID: PECER2019_10000
Title: Development and Performance Evaluation of Self-Generating Enhanced Foam water plugging system
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Abstract:
For the waterflooding of late development on an offshore oilfield has become worse, and some wells group has entered into high water cut-off period, water plugging work becomes particularly important. Due to the limited construction of offshore oilfield, space water supply difficulties, and stability of plugging agent, self-generating enhanced foam has been designed as the aimed block plugging system. The formula is determined as: 23.25% of NH4Cl+30% of NaNO2+0.1% of catalyst+0.6% of COSL-3 foaming agent +0.25% of HS-type HPAM foam stabi-lizer. Measurement point of pipe with permeability of 0.5μm2 and 2μm2 have been used in the plugging and EOR experiments. The experiments show that this system has the selective plugging ef-fect for the heterogeneous formation, especially for middle and posterior part of high per-meability formation, and the recovery rate of low permeability pipe is enhanced up to 32.15%.

ID: BFCT2019_10000
Title: Mechanical behavior and microstructure

deformation of membrane and catalyst layer of PEMFC

Name: Cong Feng
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Abstract:
Membrane electrode assembly (MEA) consists of proton exchange membrane (PEM) and catalyst layer (CL), which is the core component of proton exchange membrane fuel cell (PEMFC). Its durability limits the service life and commercial development of PEMFC. Changes in the microstructure of MEA, such as cracks in the membrane, cracking and delamination of catalyst layer and dissolution of catalyst particles, lead to a gradual decline in cell performance, in which mechanical damage is an important impact. Because the mechanical behavior and corresponding microstructure deformation can provide basic knowledge on the mechanical damage of each layer of MEA, it is significant and necessary to study them and their influencing factors. Through macromechanical experiments and molecular simulation methods, we investigated the mechanical behavior of perfluorosulfonic acid (PFSA) membranes from micrometer scale and nanometer scale and the corresponding influence factors, such as water content, side chain and strain rate. Commercial membranes (Nafion® 117 and Nafion® 212) are used as experimental samples, and two types of PFSA ionomers, representing the nanoscale parts of Nafion and Aquivion membranes, respectively, are considered as simulation samples. It is found that for meso- and nano-scale PFSA polymers, the difference between the volume of uptake water and swelling volume can be used to roughly judge the aggregation degree of polymer chains and explain the elastic-plastic deformation region. In addition, the result of nanoscale simulation also shows that long side chain decreases the winding degree of polymer chains for the PFSA ionomers, and pinhole failure causes the decline trend of stress-strain curves. A catalyst layer (CL) has three basic constituents: the catalyst, carbon support, and ionomer. An electrochemical reaction occurs between oxygen and hydrogen, accompanied by the generation of the corresponding current and water [7]. Currently, the mechanism of the effects of hydrogen, oxygen and water content on the mechanical behavior of CL is still unclear. In our work, molecular dynamics simulations were employed to investigate the uniaxial tensile process of CL. The result shows that the Young's modulus and yield stress of the CL can be enhanced by increasing the oxygen content and decreasing the water content and hydrogen content. During stretching deformation, holes are formed initially in the hydrophilic region, causing the structure to be broken with large deformation, and Pt/graphene particles are always encapsulated by ionomers.

ID: CSPT2019_10001

Title: ffect of Oxygen Addition on Structural, Optical and Morphological Properties of Ultrathin ZnO Films Deposited by RF Magnetron Sputtering

Name: Na-Fu Wang
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Abstract:
In our past, we successfully increased the AZOY/n-Si heterojunction solar cell(HJSC) (Al/AZOY/n-Si/Al) conversion efficiency to 11.83%.However, it also had the larger lattice mismatch between AZOY/n-Si that blocking the promotion of Voc, so, we in-serted an ultrathin ZnO films (ut-ZnO) between AZOY/n-Si by RF magnetron sputter-ing as a buffer i-layer to soothe the mismatch, then, the main transmission mechanism of electron hole pairs is tunneling effect. We reference the HIT structure to fix the 7nm thickness of ZnO ultrathin films for our solar cell . In this case, we modulate the O2 ratio from 0% to 80% to improve the crystalline and quality of the ultrathin ZnO films.

ID: CEES2019_10000

Title: The method of testing for asbestos in electronic and electric products through polarizing

microscope and X-ray diffraction

Name: Hongwei Wang
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Abstract:
Asbestos is widely applied in such sectors as manufacturing automobiles, tractors, chemical industrial equipment, and electric equipment. Asbestos fiber is harmful to human health. Therefore, the technology of testing for asbestos in products is especially important. At present, in our country's national specifications, there is no determination method or specification that is applicable to the asbestos in electronic and electric products. In this article, the components of asbestos in electronic and electric products are identified using the method of combining polarizing microscope with X-ray diffractometer. This method is simple, fast, highly reliable, and suitable to be widely adopted.

ID: CSPT2019_10003

Title: Application and Practice of High-precision Solar Resource Monitoring Technology in Photovoltaic Power Plant Area

Name: Rong Zhou
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Abstract:
Solar resource monitoring and evaluation is the foundation of informatization of photovoltaic power station. In 2016, China began to bring in high-precision solar resource monitoring technology which provides reliable basic data for the photo-voltaic informatization development. This paper systematically sorts out design basis, monitoring elements and system architecture of high-precision monitoring station, and analyzes operation effect of high-precision solar resource monitoring station from performance of solar radiation meter and prediction results of lumi-nous power, which provide important data support for analysis of power genera-tion efficiency of photovoltaic module, prediction of power generation of power station, evaluation of operation effect of power station, etc.

Part V Instructions for Presentations

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- Laptops (with MS-office & Adobe Reader)
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Part VI Hotel Information

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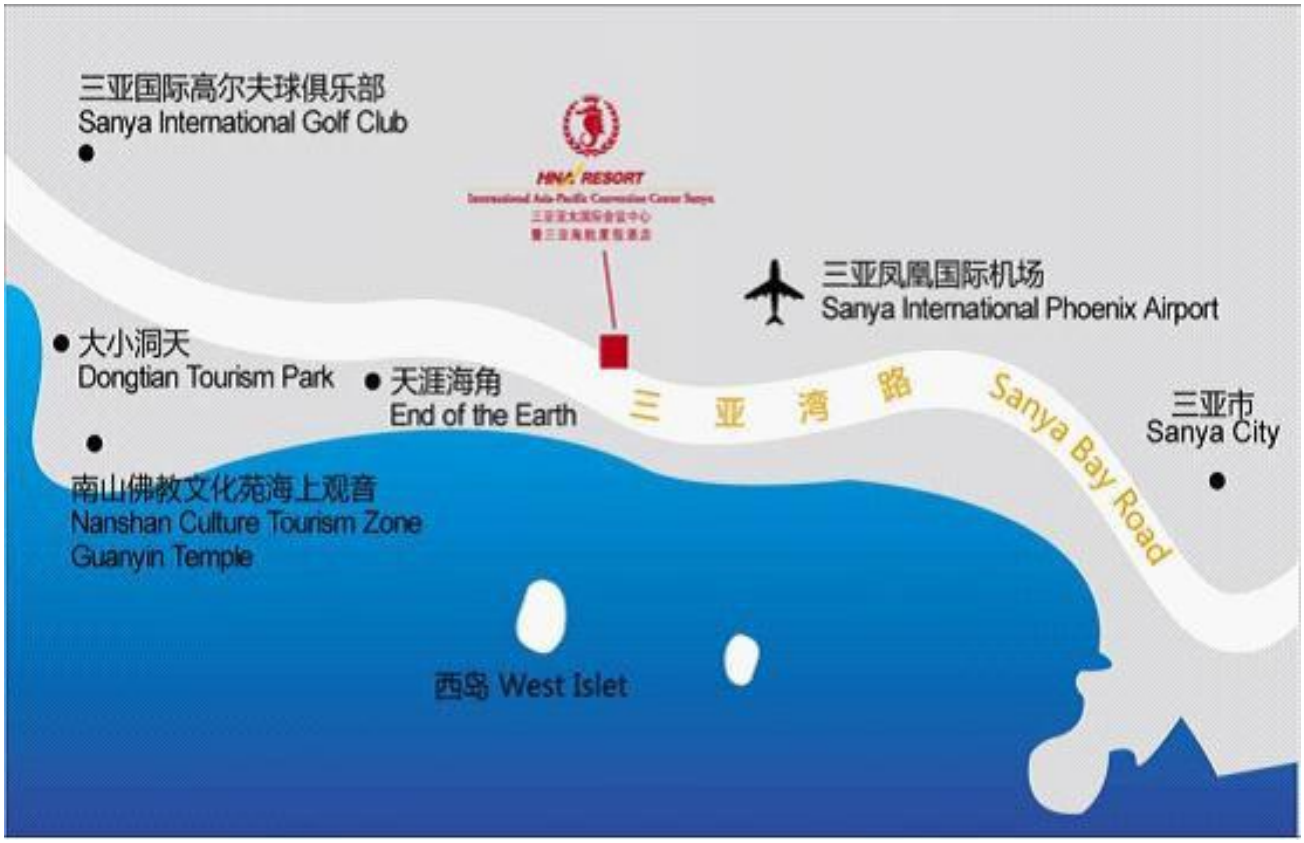

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