



CONFERENCE E-BOOK

4th International Conference on
**Applied Science,
Engineering, and Technology**

International Conference on
Optics, Photonics, and Lasers

3rd International Conference on
**Aerospace, Mechanical, &
Mechatronics Engineering**

June 21-22, 2023 | Dubai, UAE

Novotel Suites Dubai Mall of the Emirates,
2A Street - opposite Mall of The Emirates - Al Barsha -
Al Barsha 1 - Dubai - United Arab Emirates
Conference Code: **MKJDCXDG**





INOV SCITECH

Inov SciTech is an organization dedicated to organizing conferences, meetings, seminars, and workshops focused on Clinical, Medical, Life Sciences, Engineering, and Technology. We strive to promote the latest research, developments, and issues in the scientific community, providing a platform for leading academic scientists, researchers, and scholars to exchange and share their experiences and research results.

Our primary goal at Inov SciTech is to support research excellence by fostering networking platforms. We are committed to encouraging global communication and collaboration, promoting professional interaction, and facilitating lifelong learning. Additionally, we aim to recognize the outstanding contributions of individuals and organizations within these fields.

Inov SciTech strongly believes in inclusiveness and is committed to affirmative actions that ensure equal opportunities for all. We value diversity and strive to create an environment that welcomes and embraces individuals from various backgrounds.

WHO WE ARE

Inov SciTech specializes in organizing international scientific conferences, meetings, and workshops. Our aim is to encourage networking and facilitate knowledge sharing among scientists, dynamic professors, dedicated academicians, intellectual scholars, leaders, and research fellows. Through these events, we foster opportunities for building and strengthening connections, as well as providing a platform for discussions and demonstrations of the latest technologies in various fields.

WHAT WE DO

Inov SciTech plays a crucial role in revitalizing and enhancing the knowledge of Science, Engineering & Technology. We aim to analyze the past, investigate the present, and formulate innovative approaches for applied science in the future. Our commitment is to provide top-quality content, ensuring an exceptional delegate experience. We offer outstanding networking opportunities, connecting equally passionate professionals in the field. Moreover, we provide a valuable platform for personal interactions, fostering a strong sense of association among individuals.

MISSION

Inov SciTech strives to establish an ideal platform that promotes research by facilitating connections among scientists and researchers across different disciplines. We achieve this through organizing conferences and workshops that foster an environment conducive to information exchange, the generation of novel ideas, and the advancement of technologies in the fields of Science and Technology. Our goal is to provide a dynamic space where collaboration and interdisciplinary discussions flourish, leading to innovative breakthroughs and discoveries.

Upcoming Conferences

2023

Rome, Italy

Global Summit on
Civil, Architectural, and Environmental Engineering.
October 16-17, 2023.
Web: <https://inovscitechconferences.com/23/rome/civilarchenveng/>

4th International Conference on
Aerospace, Mechanical and Mechatronics Engineering.
October 16-17, 2023.
Web: <https://inovscitechconferences.com/23/rome/mechengg/>

3rd International Conference on
Robotics and Artificial Intelligence.
October 16-17, 2023.
Web: <https://inovscitechconferences.com/23/rome/robartInt/>

5th Global Conference & Expo on
Nanoscience and Nanotechnology.
October 18-19, 2023.
Web: <https://inovscitechconferences.com/23/rome/nanscitech/>

Global Summit on
Nanomaterials and Applications.
October 18-19, 2023.
Web: <https://inovscitechconferences.com/23/rome/nanmatapp/>

Global Summit on
Chemical Engineering and Catalysis.
October 20-21, 2023.
Web: <https://inovscitechconferences.com/23/rome/cheengcat/>

6th International Conference on
Biopolymers and Polymer Chemistry.
October 20-21, 2023.
Web: <https://inovscitechconferences.com/23/rome/biopolychem/>

5th International Conference on
Applied Science, Engineering, and Technology.
October 20-21, 2023.
Web: <https://inovscitechconferences.com/23/rome/appsciengtech/>

2024

Kuala Lumpur, Malaysia

Global Conference & Expo on
3D Printing & Additive Manufacturing.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/3d-printing/>

5th International Conference on
Aerospace, Mechanical and Mechatronics Engineering.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/mechengg/>

7th Global Conference & Expo on
Materials Science and Engineering.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/matscieng/>

6th Global Conference & Expo on
Nanoscience and Nanotechnology.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/nanscitech/>

2nd International Conference on
Optics, Photonics, and Lasers.
April 24-25, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/lasoptpho/>

International Conference on
Astronomy, Astrophysics and Space Science.
April 24-25, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/astrophysics/>

International Conference on
Electronics and Electrical Engineering.
April 24-25, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/eee/>

International Conference on
Renewable and Sustainable Energy.
April 24-25, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/renewseng/>

Global Conference on
Public Health and Healthcare Management.
April 26-27, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/public-health/>

Global Conference on
Nursing and Health Care.
April 26-27, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/nursing/>

Plenary Forum

(Day 1)



Charles A. Petty
Michigan State University, USA

Interpenetrating Multiphase Turbulent Flows

Interpenetrating mixtures of gases, liquids, and solids are encountered ubiquitously in nature and in industry (see Brodkey, 1967; Manninen et al., 1996). Multiphase equations-of-change (MEOC) for mass, linear momentum, angular momentum, energy, and entropy are exact, but not closed. The MEOC for angular momentum will be applied to the theory of structured continua by Dahler and Scriven, 1961 and 1963. Davidson's book (2013) on turbulence with rotating fluids, stratified fluids, and electrically conducting fluids will be incorporated with all MEOCs.

It is noteworthy (and obvious) that the MEOC for linear momentum has two different stresses: the Cauchy stress, which is an objective operator; and, the Reynolds "stress", which is a realizable operator (Koppula, 2009, et al.). The MEOC for mass, energy, and entropy will also be discussed. Unlike molecular scale fluctuations, it is noteworthy that continuum scale hydrodynamic fluctuations are not objective vector fields.

The computational fluid dynamic (CFD) technologies can reproduce experimental benchmark flows; but, how could the CFD technologies jump from an interpolating tool to a predictive tool? We need to think about this. Any ideas?

Brodkey, R. S., 1967, The Phenomena of Fluid Motions, Addison-Wesley Series in Chemical Engineering.
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Abdelmageed A. Elmustafa

Old Dominion University, Norfolk and Newport News, USA

Research activities in the Applied Research Center Located inside Thomas Jefferson National Accelerator Facility Including Synthesize and RF Magnetron Sputtering of HEAs and Microelectronic Thin Films

In the first part of my talk, I plan to discuss synthesize and study of RF magnetron sputtered thin films including the effects of composition, grain size, and sputtering temperature. We fabricate multipurpose thin films including HEAs for hypersonic applications, exit-windows for accelerator physics, SAC films for microelectronic solder joints, and single element films for various purposes. We discuss the mechanical/structural properties of the fabricated films including elastic properties, creep/activation volume analysis, and films' structure properties. In the second part of my talk, I plan to discuss results of accelerator physics research with Thomas Jefferson National Accelerator Facility. This work encompasses three independent studies. First, the outgassing rates of three nominally identical 304L stainless steel vacuum chambers were studied to determine the effect of chamber coatings (silicon and titanium nitride) and heat treatments. Second, the high voltage performance of three TiN-coated aluminum electrodes, before and after gas conditioning with helium, was compared to that of bare aluminum electrodes, and electrodes manufactured from titanium alloy (Ti-6Al-4V). Third, the effect of antimony thickness on the performance of bialkali-antimonide photocathodes was studied. Finally, I discuss ongoing research for NASA Langley Research Center for experiments of the effect of the copper donor material-assisted friction stir welding of AA6061-T6 alloy on downward force, microstructure, and mechanical properties. We also discuss the elastic properties of the non-mixing copper donor assisted material in friction stir welding of aluminum alloys using nanoindentation. Using finite element analysis and analytical modeling, we also investigate the strain rate sensitivity of the hardness in indentation creep (m_H) and the relationship between m_H and the strain rate sensitivity of the flow stress, m_σ , for cone (self-similar) and spherical (non-self-similar) indenters. m_H/m_σ results extend previous results (Elmustafa et al, 2007a, b) for cones in terms of a universal curve that describes the ratio m_H/m_σ as a function of $H/E^*/e$.

Biography:

Abdelmageed A. Elmustafa, Professor and Mitsubishi Kasei Endowed Chair, Director, NanoMaterials and Properties Testing Laboratory (NMPTL). Ph.D., Materials Science and Engineering, University of Wisconsin-Madison in 2000. Post- doctoral fellow, Materials Science and Engineering Department, University of Wisconsin-Madison. Principal Investigator and Program Manager at Piezomax Technologies, now NPoint. Senior Research Scientist, NASA Langley Research Center-ConITS, Hampton, Virginia.

Visiting Research Professor, Department of Mechanical and Aerospace Engineering, Princeton University. NJ.

Distinguished research program funded by industry, NSF, NASA, Thomas Jefferson National Accelerator Facility (Jlab), etc.

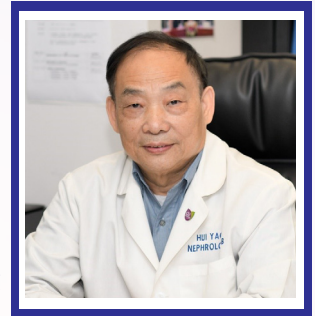
Principal interests: synthesis and RF magnetron sputtering of thin solid films including HEAs, study of Nanoscale Mechanical Behavior of solids researching plastic flow properties and the fundamental atomic scale mechanisms. Study of computational and experimental nanoscale mechanical properties

Keynote Forum

(Day 1)

Hui Yao Lan

The Chinese University of Hong Kong, Hong Kong



Self-Carried Nanodrug (SCND-SIS3) as a Targeted Therapeutic Agent for Cancer

We recently found that TGF- β 1 promotes cancer via a Smad3-dependent tumour microenvironment (TME) as deletion of Smad3 suppresses tumour growth, invasion and metastasis in two syngeneic mouse tumour models. Importantly, we develop a novel anti-tumor immunotherapy by targeting Smad3 with a self-carry nanodrug-SIS3 (SCND-SIS3). Results show that treatment with SCND-SIS3 can largely suppress invasive lung carcinoma, resulting in a 5-fold increase in anti-cancer activities over unmodified SIS3 by promoting NK cell-mediated cytotoxicity against cancer. Mechanistically, compared to unmodified SIS3, SCND-SIS3 possesses superior anti-cancer effects with enhanced bioavailability and biocompatibility, therefore representing as a novel therapeutic strategy for lung carcinoma with promising clinical potential. [The study is supported by ITF (ITS/138/17)]

Biography:

Professor Hui-Yao Lan is a Professor of Medicine, Associate Dean in the Faculty of Medicine, and Associate Director in Li Ka Shing Institute of Health Sciences, the Chinese University of Hong Kong. Professor Lan completed his MD (1977) at Sun Yat-sen University and PhD (1991) at Monash University. His previously held Senior Lecturer (Hon) at Monash University, Professor(tenured) at Baylor College of Medicine, and Professor at the University of Hong Kong. His research interest is TGF-beta/Smad signaling in kidney/cardiovascular diseases and tumor microenvironments. He has published 400 peer-review papers with citations over 40,000 and h-index 108. He has been serving as an Editor/Associate Editor and Editorial board member in many scientific journals.

Giovanni Perillo

University of Naples Parthenope, Italy
Wessex Institute of Technology, New Forest, UK



Social Sustainability in New Millennium: a Challenge Cities Cannot Miss

Cities are the engines of the world economy and they can be considered catalysts of creativity and innovation. In the EU, for example, approximately 68% of the population resides in a metropolitan region and generates 67% of the GDP. At the same time, these regions are also places where persistent problems, such as unemployment, segregation and poverty are most acute. The policies pursued in relation to urban areas therefore have a broader meaning as a whole.

The multiple dimensions - environmental, economic, social and cultural - of urban life are intertwined, therefore positive urban development can only be achieved through an integrated approach. It is necessary to combine measures concerning urban material renewal with measures aimed at promoting education, economic development, social inclusion and environmental protection.

The birth of intense collaborations between citizens, civil society, the local economy and the various administrative levels is therefore a prerequisite for this process. This approach is crucial right now, given the difficult challenges facing world cities today, ranging from specific demographic changes to the consequences of economic stagnation in terms of job creation and social progress and the impact climate change. The response to these challenges will be decisive for the realization of a smart, sustainable and inclusive society.

"Intelligent" and "sustainable" are terms widely used and applied in descriptions of city policies, plans and programs; however, frequent and sometimes generic use of these adjectives has made their meaning opaque and confusing. Here we will try to clarify the meaning of the terms "sustainable city" and "smart city" through some reflections and some examples.

Biography:

Giovanni Perillo, Professor.

Graduated in Civil Engineering from the University of Naples Federico II, Italy, has been Professor of Environmental Topics at University of Naples Parthenope. He is currently Adjunct Professor of Circular Economy at Wessex Institute of Technology in Southampton and Visiting Professor of Environment Management at Cranfield University in Bedford, UK. He has been involved in several worldwide international research projects and he is author of more than 120 scientific publications in wide fields of engineering. He has also planned several high-technical engineering projects in environmental field. He's currently member of several worldwide International Scientific Committee and also of several Editorial Boards. Since 1996 he is member of National Geographic Society and since 1996 member of New York Academy of Sciences.



Miroslav Vaclavik*, Petr Jirasko
VUTS Liberec, The Czech Republic

Results of the Research of CAM Mechanisms in VUTS Liberec

The paper will cover the historical development of the research work of VÚTS, a.s., in the field of conventional and electronic cam mechanisms from the 1980s to the present. In VÚTS, a.s., the development of production machines and the pressure for ever-increasing productivity has ensured a high level of applied research in the area of technical mechanics, especially in the field of applied research of cam mechanisms and linkages. With the creation of theoretical basis for calculations and the development of our own computer systems, a production base for the manufacture of radial and axial cams using the technologies of milling, grinding and electro-erosive machining was created simultaneously. In this area, VÚTS, a.s., achieved high levels comparable on a global scale. VÚTS, a.s., with its specialization in calculations and production of cams, soon became a unique workplace on the scale of the Czech republic. In its most basic form, the area of activity of VÚTS, a.s, in the field of applied mechanics can be generalized to the issue of working link drives of production machine mechanisms. Production machines are no longer only textile machines, but all production machines of the processing industry (packaging, glass, forming, printing machines, etc.). With the rapid development of computer technology in recent decades, there have been unprecedented successes in the technical fields of mechanical engineering, electrical engineering and electronics. However, technical practice still places increasing demands on productivity, quality, variability and flexible production automation. These production requirements can be met by the findings of the three above-mentioned fields in mutual synergy when solving the specific problem of optimizing motion functions that are realized by kinematic excitation. This kinematic excitation is derived from a mechanical, electronic or combined cam mechanism. The latest research stage of applications of electronic cams in the drives of working mechanisms will thus be presented.



Lukas Vrablik
CTU in Prague, Czech Republic

Applied Science in Civil Engineering

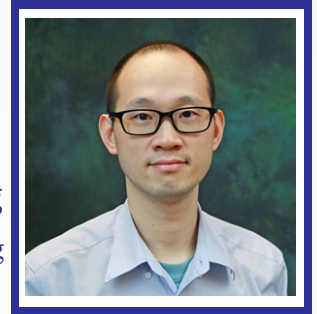
The paper and presentation will describe applied results of science in civil engineering. Especially paper will be focused on the new materials, construction methods, computational simulation and monitoring of bridges.

Biography:

Lukas Vrablik, Associated profesor, Head of the Department of Concrete and masonry Structures, CTU in Prague, Faculty of Civil Engineering & VALBEK, Ltd., Technical Director.

Yuen Hong Tsang

The Hong Kong Polytechnic University, Hong Kong



Aerosol Jet Printed 2D Materials based Saturable Absorbers for Ultrafast Lasers

2D Transition metal dichalcogenides (TMDs) have recently attracted substantial research interest in nonlinear optical applications due to their strong broadband absorption, tunable-bandgap, and excellent nonlinear optical properties. However, present research on TMDs-based photonic devices has scalability, compatibility, and reproducibility issues. Aerosol jet printing (AJP) has proven superior to other technical approaches while fabricating high-precision photonic devices, owing to its high printing resolution, less restrictive ink viscosity requirements, and flexibility in printing focusing ratio. Herein, palladium ditelluride (PdTe_2) TMD material with low-bandgap and high carrier mobility, is deposited on a side polished fiber through the AJP method for preparing saturable absorbers (SAs) for the first time. By utilizing these SAs broadband ultrafast laser pulses are generated in the near-to-mid-infrared regime. The obtained mode-locked laser pulses with pulse durations in the ps to fs range (170 ps, 570 fs, and 1.59 ps in 1 μm , 1.5 μm , and 2 μm fiber-laser sources, respectively) indicate that the AJP is an ideal choice for fabricating SAs for ultrafast photonics devices. Furthermore, the generation of Q-switching and high-repetition rate (0.7 GHz) based harmonic mode-locking pulses in the telecommunication-band indicate that the developed technology could be used in various nonlinear optics and optoelectronics applications in the future.

Biography:

Dr Tsang received his B.Sc. and Ph.D. degrees in Physics from the University of Manchester, UK, in 2000 and 2004, respectively. He is currently working as an Associate Professor in the Department of Applied Physics at The Hong Kong Polytechnic University, where the main focus is bestowed on applied research and consultancy in applied physics, including mode-locking laser development, nonlinear optics, solar energy conversion and advanced materials-based laser photonic device development. Dr Tsang's academic research interests cover topics including novel 2D materials and nanostructure used for optics and photonic devices, nonlinear optical materials, high power lasers, and novel materials for energy applications. He has published over 177 SCI journal articles with an h-index of 47 and total citations >7,416 in Scopus. Dr Tsang was ranked in the top 2% of the world's most-cited scientists in the field of optoelectronics and photonics by Stanford University in 2019. Previously, he has completed several industrial projects successfully, funded by companies including Thales Optronics plc., Huawei, Fianium-Asian Ltd. and Colgate Palmolive (UK) Ltd.

Invited Talks

(Day 1)

Haipeng Wang
Shandong University, China



Engineered Sandwich-structured Composite Wound Dressings with Unidirectional Drainage and Anti-adhesion Supporting Accelerated Wound Healing

Proper management of exudate is of great clinical value for reducing wound infection and promoting wound healing, thus various dressings have been studied to address this widespread medical challenge. Herein, we present a novel sandwich-structured composite wound dressing (SCWD), integrating of a superlyophobic (SLO) polydimethylsiloxane (PDMS) layer, a superlyophilic gauze layer and a lyophobic PDMS layer, with particular unidirectional droplet drainage and stable anti-adhesion capabilities, which realizes effective management of wound exudate and provides a favorable environment for wound healing. Thanks to the stable SLO property on the PDMS surface with hierarchical micro/nanostructures, the continuously accumulated wound exudate at the interface between dressing and wound surface is gradually deformed, eventually passing through SLO PDMS layer through milli-scale channels and being absorbed by gauze layer. Experimental results show that the application of SCWD could significantly reduce the occurrence of wound infection, avoid the tearing of wound tissues when replacing dressings, and accelerate wound healing by approximately 20%. The combination of SCWD and lyophilized powders of stem cells supernatant (LPSCS) is verified to better accelerate the healing process. The proposed method offers great potential in clinical applications particularly for acute trauma wound treatments.

Biography:

Haipeng Wang, a postdoctoral fellow working in the School of Mechanical Engineering, at Shandong University. He received his PhD degree in Material Processing Engineering from Beihang University in 2020, and studied at Singapore Institute of Manufacturing Technology (SIMTech) from July to December 2017. His current research focuses on ultrafast laser micro/nano manufacturing, functional surface preparation and laser joining dissimilar materials.

Juergen Lademann

Charite University Medicine Berlin, Germany



New Optical Method for the Non-invasive Determination of the Sun Protection Factor of Sunscreens

The determination of sun protection factors (SPFs) is currently an invasive method, which is based on erythema formation (photo test). In the present paper, an optical method for the determination of SPFs based on diffuse reflectance spectroscopy is described. For this purpose the principle of the “photon banana” is used. The UV light is led to the sunscreen-treated skin via an optical fiber and the reflected light is detected by a bundle of other optical fibers that are surrounded by the excitation fiber at different distances. This way, the UV radiation has to pass the sunscreen-treated skin surface twice, before it is detected by a sensitive diode that is positioned behind the detection fibers.

First experiments carried out on pig ear skin showed a strong correlation between the SPF values determined by in vivo erythema measurements in the analytical laboratories to the measured optical signal. After approval of a study to apply this method on human subjects by the Ethics Committee of the Charité, the measurements were repeated in vivo on human volunteers.

The obtained results confirmed the results measured invasively in test institutes for sunscreen products. Thus, a new method was developed for in vivo SPF determination not damaging the skin.

References

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Igor A. Bilenko
Moscow State University, Russia

High Quality Factor Microresonators for Nonlinear and Quantum Optics

Micro-ring and micro-disk optical resonators are widely used in physical measurements and technical applications. The possibility to reach very high quality factor (value as high as 1011 was demonstrated for CaF₂ mm size disks) makes them extremely attractive for creating unique instruments, like high resolution spectrometers, laser distance and speed meters, frequency standards. The long lifetime of photons in the resonator material determines the low threshold for the manifestation of nonlinear effects and the possibility to resolve quantum evolution. Nowadays the technology has become mature enough for mass production of chips with resonators, the quality factor of which reaches 10⁹ at given dispersion and coupling parameters.

In our recent research we study the effects that occur when pumping is close to the threshold of parametric instability and when it is much higher. Experiments were made on the Si₃N₄ platform, with single and dual semiconductor laser pump in the self-injection locking regime. It was shown that in the case of the dual pump the lasers became mutually coupled, even when locked to different modes of the microresonator. The important role of thermal effects was also revealed. The auto and cross phase modulations arising in the microresonators with Kerr non-linearity make it possible to implement purely quantum effects: the generation of a nonclassical states of light and quantum-non-demolishing measurements. However, their experimental demonstration turns out to be extremely difficult due to losses in the outcoupling and detection scheme. We will discuss possible solutions of the problem and report the progress in our experiments.

Biography:

Igor A. Bilenko is a professor of MSU Faculty of Physics and principal investigator of the RQC coherent microoptics and radiophotonics laboratory. Received a PhD at MSU in 1991. Member of the LIGO research team. Got a Special Breakthrough Prize in Fundamental Physics 2016 for the discovery of gravitational waves (shared by all LIGO team) and Elsevier Research Excellence Award Russia 2021. Research interests are: precision and quantum measurements, non-linear and quantum optics, photonics, gravitational wave detectors.

Yung-Chun Lee* and Yong-Sin Syu
National Cheng Kung University, Taiwan



Maskless Lithography Based on Digital Light Processing for Large-Area Fabrication of Two/Three-Dimensional (2D/3D) Microstructures

This paper presents an innovative maskless lithography system which can perform both two-dimensional (2D) and three-dimensional (3D) ultraviolet (UV) patterning on a photoresist (PR) layer. After PR developing, distributed 2D or 3D PR microstructures can be obtained and used for subsequently manufacturing processes. This maskless lithography system utilizes a UV-LED light source, a digital micromirror device (DMD), and an image projection lens to project digital UV images onto a PR layer. The projected UV light is then mechanically scanning over the PR layer for UV exposure. To optimize the pattern resolution and scanning speed, a UV patterning scheme based on an innovative idea of oblique scanning and step strobe lighting is developed and experimentally demonstrated. We also demonstrate that, to precisely control the spatial distribution of projected UV dose, it is necessary to characterize and compensate the image distortion in the projected array of UV pixels. For 2D patterning, this integrated, DMD-based maskless lithography system has achieved a smallest line/spacing of $2/2 \mu\text{m}$ and a patterning resolution better than $0.2 \mu\text{m}$. Complex circuit patterns for microelectronics and IC packaging are successfully fabricated on an 8" wafer with a throughput around 10 minute/wafer. For 3D patterning and 3D microfabrication, both concave and convex microstructures with given arbitrary 3D surface profiles are experimentally obtained over large patterning area at high scanning speed. The feature sizes of these fabricated 3D microstructures are ranging from few to ten tens of μm with a profile accuracy around $0.5 \mu\text{m}$. Potential improvements and advancements on this proposed 2D/3D maskless lithography technique and their future applications will be addressed.

Biography:

Yung-Chun Lee, Distinguished Professor

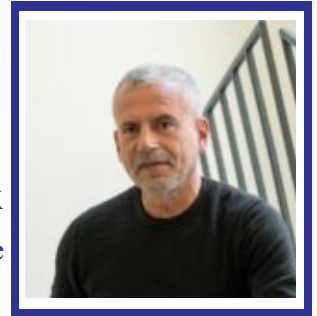
Yung-Chun Lee received the Ph.D. degree in Theoretical and Applied Mechanics from Northwestern University, USA, in 1994. From 1994 to 1996, he was a post-doctoral researcher at the Department of Engineering and Applied Physics, Cornell University, USA. After working for industry for one year, he joined the Mechanical Engineering Department, National Cheng Kung University, Tainan, Taiwan, in 1997 and is now a distinguished professor. His research interests include solid mechanics, ultrasonic non-destructive evaluation, laser micromachining, nano-imprinting lithography, contact printing lithography, roller imprinting, and maskless lithography based on digital light processing. He was awarded twice (2017, 2020) the Outstanding Research Award from the Ministry of Science and Technology (MOST), Taiwan.

Plenary Forum

(Day 2)

Michal Sourek

Czech Technical University in Prague, Prague



Designing Architecture in Virtual Reality

Coinciding with the lately reawakened focus of architecture to its original and essential concern – to physical public space, the latest technological achievements in virtual public space bring the profession and the field to the brink of a new era. For the first time in history, technologies of virtual and advanced reality allow the architects to create and work in a realm of (nearly) as many dimensions as their creation and product have. After millennia of being tied by the only two-dimensional means of interpretation of their three-plus dimensional ideas and designs, architects are receiving a tool they can use to create instantly virtual twins of the intended architecture.

Contributions to the profession, to the holistic quality of the built environment, to the efficiency of investments, and to the sustainability of terrestrial life and human societies are in sight. To make use of the virtual-twins design tool, an equilibrium and synergy between free, poetic creativity and parametric designing have to be secured. Moreover, the paradigm of creative designing, once freed from the ties of the old two-dimensional representation and communicative horizon, must undergo a transformation process, too. The tool is in the finish of primary development and undergoes testing in practice. User experience is close to being comprehensive and confirms positive. For the necessary change of design paradigm, the youngest, upcoming architects are naturally the most open. University schools of architecture have got involved, their students started using the software in their school work: the feedback is promising.

Keywords:

Architecture; Design Paradigm Transformation; Parametric Design; Poietic Design; Public Space; Virtual Reality



Charles A. Petty
Michigan State University, USA

Three Dimensional Interpenetrating Multiphase Turbulent Flows: Part II

Interpenetrating mixtures of gases, liquids, and solids are encountered ubiquitously in nature and in industry (see Brodkey, 1967; Manninen et al., 1996). Multiphase equations-of-change (MEOC) for mass, linear momentum, angular momentum, energy, and entropy are exact, but not closed. The MEOC for angular momentum will be applied to the theory of structured continua by Dahler and Scriven, 1961 and 1963. Davidson's book (2013) on turbulence with rotating fluids, stratified fluids, and electrically conducting fluids will be incorporated with all MEOCs.

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The computational fluid dynamic (CFD) technologies can reproduce experimental benchmark flows; but, how could the CFD technologies jump from an interpolating tool to a predictive tool? We need to think about this. Any ideas?

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Keynote Forum

(Day 2)

Nahla Elaraby

Technical University of Vienna - TU Wien, Austria



Formal Verification: Concept, Tools and Applications

Formal verification is to ensure that a design satisfies some properties. In order to formally verify a design, it must first be converted into a verifiable format, which is the formal model. There exist different formal modelling structures (FSM, BDD, MDD, finite automate,...) upon which formal verification methods and tools are applied. Formal verification is getting more and more employed in different types of systems either hardware or software due to the capabilities it offers in ensuring the correctness of a system in early design stages. During this lecture you will be introduced to basic formal modelling and verification concepts, tools and recent application domains.

Biography:

Nahla Elaraby received B.Sc., M.Sc., and Ph.D. degrees in Electrical and Computer Engineering from Ain Shams University, Egypt in 2002, 2007, 2013 respectively. She started her academic career Since 2003 as a teaching assistant and was promoted to a lecturer then assistant professor in 2013 at the Canadian International College in Cairo. She also worked at the American University in Cairo and the Arab Academy for Science and Technology in teaching and research. Her main research work is related to Formal Verification, FPGA design, Fault tolerance and Reliability. Since 2017, she joined Technical University of Vienna - TU Wien, where she is actively teaching "Advanced FPGA design" and "Hardware Verification" courses and is currently a post doc university assistant at the Institute of Computer Technology.

Loredana Santo* and Fabrizio Quadrini

University of Rome Tor Vergata, Rome, Italy



Advanced Materials and Space Sustainability

Advanced materials with high performance and shielding properties are required for space exploration and life in outer space considering a sustainable development. In this context, Shape Memory Polymer Composites (SMPCs) and Cosmic Ray Shielding (CRS) materials are extremely interesting for their properties and behavior. SMPCs can clean space by removing space debris and allow the use of solar energy by deploying solar panels and solar sails. They can be manufactured by using commercial carbon fiber reinforced (CFR) prepregs for autoclave molding as plies (HexPly/M49/42%/CHS-3 K by Hexcel) and an uncured epoxy resin in the form of green fine powder (Scotchkote 206 N by 3 M) as interlayer. The CRS materials are instead new shielding material for spacesuits (i.e., flexible) and spacecraft materials. The CRS materials are a combination of low-density polyethylene (LDPE) film and inorganic particles (Samarium cobalt (Sm-Co) and boron nitride (BN) powders). SMPCs and CRS materials have been successfully tested by the authors in different space missions for evaluating their behavior in microgravity and the harsh space environment.

In this keynote, the new concept of space sustainability is highlighted, and the achievement in advanced material design and testing on ground and in Space is discussed.

Biography:

Loredana Santo, Full professor of Manufacturing Processes

Loredana Santo is full professor of manufacturing processes at the University of Rome Tor Vergata, Italy. She is the head of the Department of Industrial Engineering and head of the Space Sustainability Center. She has been PI of experiments on board of the International Space Station and involved in international activities and projects. Her scientific activity has been mainly focused on the following topics: innovative materials and manufacturing processes, circular economy, and space sustainability. She is author of over 170 manuscripts accepted in international journals, books, and conferences proceedings.

Zhongwei Guan

Technology Innovation Institute, United Arab Emirates



Structural Behaviour of 3D Stitched Sandwich Structures

This paper presents a novel stitching method for enhancing the mechanical properties of composite patch repair as well as the bonding behaviour between skins and core for a sandwich structure. In this approach, holes were drilled through the scarf patch repaired and sandwich core. The vacuum resin infusion technique was then used to integrate the threads with the sandwich core-skins and fix the patch to the parent part. The stitch-reinforced scarf patch is to reduce the amount of parent material that is removed during the repair. Here, the effects of varying both the hole diameter and the scarf angle on the load carrying capacity of the repaired laminates are studied. The tensile strength, strain distribution and failure mechanisms are investigated using the digital image correlation (DIC) technique. It was found that by introducing a 2.5 mm diameter stitching hole, the ultimate tensile strength of repaired laminates related to three scarf angles is increased by up to 20, 27 and 45% respectively, relative to traditional laminates with an equivalent scarf ratio. In the stitched foam-core sandwich panels, the sandwich panels consist of ~1.5 mm thick carbon fibre (CF) skins and relatively thick (~ 30 mm) foam-core sandwich composite panels while varying the volume fraction of the CF through-thickness reinforcement. X-ray computed tomography (CT) is utilised to determine the “as-manufactured” quality of the stitched panels. Besides, mechanical characterisation in the form of flatwise and edgewise compression testing are carried out with in-situ 3D Digital Image Correlation (DIC). Results demonstrate the positive effect of the stitching yarns on such structures’ out-of-plane properties: stiffness and strength. Moreover, fractography analysis directly links the macroscopic response and the captured damage/failure mechanisms.

Biography:

Professor Zhongwei Guan is Executive Director of Advanced Materials Research Centre of Technology Innovation Institute in Abu Dhabi. He received his first degree on Solid Mechanics in Sichuan University China in 1982 and was awarded PhD on Structural Behaviour of Polymeric Pipelining in University of Bradford UK in 1993. He was Reader in Lightweight Composite Materials and Structures at the University of Liverpool. He has published more than 170 SCI papers in refereed leading international journals on lightweight composite structures subjected to extreme loading conditions. He was Chairman of the 5th International Conference on Computational Methods held in Cambridge in 2014. He is a member of the editorial board of International Journal of Impact Engineering, Applied Composite Materials and Advanced Materials Letter.

Halim Hamid Redhwi

Dhahran Techno Valley Holding Company King Fahd University
of Petroleum & Minerals, Saudi Arabia



University – Industry Collaboration for Harnessing Emerging Technologies

The creation of an innovation ecosystem is an emerging paradigm for corporate strategy positioning to create value by integrating universities and industries to solve technological challenges resulting in the economic growth. Dhahran Techno Valley (DTV) is a unique Science Park, integrates academia from a globally renowned university King Fahd University of Petroleum & Minerals (KFUPM) and the industry, jointly addressing technology challenges in the energy sector. This presentation elaborates the innovation ecosystem at play in KFUPM – the development of a novel technology namely High Severity Fluid Catalytic Cracking (HS-FCC) that converts low value heavy oil to high value products, academia – industry collaboration, establishment of a world class Science Park (Map Below), localization of technologies and lastly the economic impact of DTV Science Park, all of this in alignment with the Vision 2030 of Kingdom of Saudi Arabia. Overall, this paper highlights the role of DTV in promoting knowledge-based economy that requires the integration of knowledge generation, knowledge transfer and utilization fostering academia-industry partnerships.



Ruxandra Mihaela Botez

École de technologie supérieure, Université de Québec, Canada

Morphing Green Aircraft Design Technologies for Fuel Consumption Reduction

Green aircraft technologies are used to reduce fuel consumption, therefore flight time, to bring therefore important savings to the airlines, and benefits to the environment. One of these technologies is related to morphing wing design and experimental validation. The Italian-Canadian multidisciplinary project called “Morphing Architectures and Related Technologies for Wing Efficiency Improvement” was led at the ÉTS in Canada, in collaboration with other Canadian partners from Bombardier, Thales, IAR-NRC and École Polytechnique, and with Italian partners from Alenia, CIRA, and University Federico II in Naples.

In this project, a new morphing technology was used to change the shape of the upper surface composite skin of a transport aircraft wing-tip with the aim to improve its aerodynamic performances (drag reduction, increase in lift to drag ratio, flow transition delay). The upper surface skin of the morphing wing-tip was equipped with thirty-two piezoelectric kulite type pressure sensors; they were used to measure pressures, and thus, aerodynamic loads acting on the morphing wing-tip for different flight cases expressed in terms of Mach numbers between 0.15 and 0.25, wing angles of attack between -3 deg. and 3 deg., and aileron deflection angles between -6 deg. and 6 deg. Therefore, optimal airfoils shapes were designed for almost 100 flight cases.

Four actuators were used to obtain the morphed optimized wing-tip shapes. The optimal shapes for aerodynamic performances increase were obtained using aero-structural design studies. The flow transition point position for each optimal shape was evaluated experimentally using the infra- red thermography. The designed optimal shapes of the wing-tip were validated using various new controller techniques that were applied during wind tunnel tests at the IAR-NRC, that were based on artificial intelligence techniques (neural networks, fuzzy logic). These multidisciplinary aero- structural-control methodologies were experimentally validated using wind tunnel tests.

Biography:

Ruxandra Mihaela Botez, Full Professor, PhD, Eng., Canada Research Chair Holder Tier 1 in Aircraft Modeling and Simulation Technologies and Head of the Laboratory of Applied Research in Active Controls, Avionics and AeroServoElasticity LARCASE. Dr Ruxandra Botez is Full Professor at ÉTS in Canada since 1998. Ruxandra is AIAA Associate and CASI, CAE and RAeS Fellow. She is Editor-in-Chief of the INCAS Bulletin. Ruxandra graduated more than 400 students. Ruxandra published more than 200 journal articles, 300 conference papers and 7 invited book chapters. Ruxandra and her team have obtained more than 60 awards; she also gave more than 50 invited speaker presentations. Ruxandra works in collaboration with international aerospace companies, such as Bombardier Aerospace, CAE Inc., Esterline CMC Electronics, Bell Helicopter Textron, Thales Aerospace, GlobVision, FLIR Systems and IAR-NRC, in the USA with Presagis and NASA, in Italy with Alenia and CIRA, in Mexico with Hydra Technologies, in Germany with DLR.



Nazenin Gure
Marmara University, Istanbul, Turkey

Title: Hybrid Energy Harvesters And an Example Of Modeling Commercial Piezoelectric

Energy harvesting stem from the concept of harnessing ambient energy by means of electromagnetic, electrostatic, piezoelectric, antenna, wind turbines, solar panels and various innovative transducers. As the ambient energy types varies and shifts for the same static or moving point of harnessing, hybrid energy harvesters become preferable. Among them; according to the types of harvesters and harnessed energy sources, fundamental classifications are formed. Within these classifications, according to scavenged methodology, sub categories are set. Relatedly, one of the break-through energy harvesters of piezoelectric materials will be issued after general review of energy harvesters and hybrid energy harvesters. Then, a case-study modeling of vibration energy harvesting from railway application will be shared. The final presentation will take into account of the modeling of the commercial piezoelectric transducers, collecting the real-railway vehicle vibration data and consequent signal analysis, and as a final point; maximum potential power outputs of commercial piezoelectric vibration energy harvesting from railway vehicles regarding the optimum loads will be presented.

Biography:

Nazenin. GURE: Research Assistant at Dep. of Mechanical Engineering, Beykent University, Istanbul, TR; CEO of ENHAS R&D Energy Systems LLC.; R&D Lead of FLYtelligence Technology Solutions IC; and Climate Change and Sustainability Lead at WITI (Women in Technology International).

Nazenin Gure is PhD Candidate at Dep. of Electrical and Electronics Engineering, Marmara University. Her M.Sc. Thesis “Vibration Energy Harvesting from Railway Vehicles with Commercial Piezoelectric Transducers” has been issued by PIEZO INC. Her start-up project is selected for Technological Entrepreneurship Industry Support, funded by Ministry of Science, Industry, and Technology. She won the scholarship of primary research subjects by Scientific and Technological Research Council of Turkey. She has one national patent along with pending world patent. In consistent with her keynote submission, she was selected as both moderator and honorable invited speaker for in Albedo Meetings, International Meet On Civil, Structural And Environmental Engineering, Munich, Germany, May 2022; and 3rd Int Conf on Biofuels and Bioenergy, Paris, France, 11 Nov 2022.

Svetlana von Gratowski

Kotel'nikov Institute of Radioengineering and Electronics Russian
Academy of Sciences, Russia



Mechanical and Electromagnetic Effects due Interactions of Individual Carbon Nanotubes with External field

Report is devoted to study of single closed carbon nanotubes (CNTs) synthesized by arc method with deposition on wire metal electrodes made of tungsten, nickel and platinum. We have investigated interaction of single closed CNTs in cold field emission mode with application of microwave radiation. Using nanomanipulation in scanning electron microscope chamber it was created a nanodiode circuit consisted of a cathode with a single closed CNT, an anode, and a vacuum gap. The circuit was irradiated with microwave radiation. The current-voltage (I-V) characteristics and differential conductivity of this nanodiode circuit were studied. The use of a micromanipulator made it possible to set the gap between tungsten anode and the top of the emitter with single CNT in the range from several hundreds nm to 1 μm and provide investigation of dependence of I-V on the gap between the anode and cathode with CNT emitter. Following phenomena were found: 1) under certain conditions, resonant peaks of the diode circuit, and regions of negative differential conductivity appear on I-V, 2) under other conditions, stable periodic current oscillations appear, which are accompanied by stable mechanical oscillations of CNTs. The oscillation amplitude reached several hundreds of nanometers up to the contact with the anode. The effect has a threshold character. 3). I-V of a single CNT was measured by scanning tunnel microscope (STM) method. The I-V characteristics of single CNT measured by the STM method also revealed regions of negative differential resistance. The report gives possible explanations for these phenomena. It should be noted that the obtained results show that by irradiating a single closed CNT in cold field emission mode, with certain microwave frequencies, make it possible to generate both mechanical oscillations of CNT and electromagnetic oscillations in microwave range. The work was supported by RSF grant 22-19-00783.

Biography:

Dr. Svetlana von Gratowski, leading research scientist.

Dr Svetlana von Gratowski is leading researcher in Kotel'nikov Institute of Radioengineering and Electronics Russian Academy of Sciences. She has expertise in research in nanotechnology, nano-manipulation, nano-assembling, shape memory alloys. She has had invented and suggested the original solutions for frontier mechanical bottom-up nano-assembling, nano-manufacturing and nano-fabrication of single nanodevices based on individual nano-objects using the smallest and the fastest shape memory alloy nanogripper. This technology opens up perspective of the creation of single nano/micro and macro devices from individual nanotubes, nanowires and other nano-objects. Mechanical bottom-up nano assembling is going to overcome the presently existing barrier of the integration of variety of nanoobjects and nanodevices with each other and with convectional integrated circuits.

Soshu Kirihara

Joining and Welding Research Institute, Osaka University, Japan



Lithographic Additive Manufacturing of Practical Components

In stereolithographic additive manufacturing (STL-AM), 2-D cross sections were created through photo polymerization by UV laser drawing on spread resin paste including nanoparticles, and 3-D models were sterically printed by layer lamination. The lithography system has been developed to obtain bulky ceramic components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust the beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the raw material of the 3-D printing, nanometer sized metal and ceramic particles were dispersed into acrylic liquid resins at about 60 % in volume fraction. These materials were mixed and deformed to obtain thixotropic slurry. The resin paste was spread on a glass substrate with 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted to 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was automatically changed for an adequate solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In recent investigations, ultraviolet laser lithographic additive manufacturing (UVL-AM) was newly developed as a direct forming process of fine metal or ceramic components. As an additive manufacturing technique, 2-D cross sections were created through dewaxing and sintering by UV laser drawing, and 3-D components were sterically printed by layer laminations with interlayer joining. Through computer-aided smart manufacturing, design, and evaluation (Smart MADE), practical material components were fabricated to modulate energy and material transfers in potential fields between human societies and natural environments as active contributions to Sustainable Development Goals (SDGs).

Biography:

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

Invited Talks

(Day 2)



Ewa Cukrowska
North-West University, South Africa

Dissolution of Non-functionalized and Functionalized Nanomaterials in Simulated Biological and Environmental Fluids

There has been an exponential increase of nanoparticles uses in consumer products, however research into their behaviour in biological and environmental surroundings is still very limited. The static and continuous dissolution protocol were used to investigate the dissolution behaviour and kinetics of gold, silver and titanium dioxide nanoparticles in simulated biological fluids and environmental media with a wide variety of pH values and chemical compositions to predict their behaviour more accurately in real-life scenarios. The biodurability and persistence were estimated by calculating the dissolution kinetics of nanoparticles in simulated body fluids and environmental media. The effect of surface functionalization on the dissolution was investigated. The study determined the dissolution rates of various types of gold and silver nanoparticles. Dissolution was found to be higher in acidic media. Rate and degree of dissolution were dependent on the surface functionalization, pH, ionic strength of the simulated fluid and particle aggregation. Gold nanoparticles with low dissolution rates will likely be (bio)durable in biological and environmental surroundings, while those with high dissolution rates may cause short-term effects.

The citrate-coated silver nanoparticles had different dissolution rates with low pH and high ionic strength increasing the rate and degree of dissolution. The particles demonstrated changes in agglomeration state and reactivity, but their morphology remained unaltered. The fast dissolution rates in most fluids indicated that the release of silver ions would cause short-term effects. Titanium dioxide nanoparticles were very insoluble in simulated fluids. Acidic media were most successful in dissolving the particles. Higher ionic strength seawater also had a higher dissolution rate than freshwater. The dissolution rates of the particles were low and their half-times long. The particles are likely to cause both short and long-term health effects and will remain persistent in the environment.

Biography:

Ewa Cukrowska, Prof, em.

My research field is, broadly speaking, environmental analytical chemistry; in particular, speciation study of heavy metals in the environment including analytical procedures development, transport, fate, toxicity, biological uptake with modelling of solution equilibria and chemometric data validation.

Mohammed Krini

Aschaffenburg University of Applied Sciences Germany



AI-Based Speech Enhancement

In recent years, speech enhancement has attracted a considerable amount of research attention. It plays an important role in many real-world applications, including hearing aids, mobile speech communication, and robust speech recognition. The various noise reduction techniques have been developed in the last few decades can be classified by the number of microphones that were used. Single-channel techniques, such as MMSE-based approaches or Wiener filtering, are now widely utilized and find use in many applications. Speech enhancement in multi-channel systems has been realized by exploiting spatial information as well as spectro-temporal characteristics of the multiple microphone signals. In recent times, there has been a surge in the use of deep learning methods for speech enhancement, leading to notable advancements in speech enhancement.

The talk will show state-of-the-art speech enhancement schemes. Furthermore, new AI-based methods will be introduced that effectively enhance overall speech quality and improve speech intelligibility at different noise levels.

Biography:

Prof. Dr.-Ing. Mohammed Krini
Research Chair for Signal Processing and Machine Learning Competence Center Artificial Intelligence
Faculty of Engineering
Aschaffenburg University of Applied Sciences
Wuerzburger Straße 45
63743 Aschaffenburg, Germany



Mircea Mujat
Physical Sciences, Inc, USA

High-resolution Retinal Imaging

Recently, it was shown that by using a larger, offset pinhole in the adaptive optics scanning laser ophthalmoscope (AO-SLO) detection unit, images that capture multiply scattered light can reveal retinal structures with unprecedented clarity. Split-detector imaging uses two offset apertures on the opposite sides of the illumination spot and the image is obtained as the difference divided by the sum of the two offset images. This technique works well when imaging mostly round structures, like photoreceptors or red blood cells. It is also very sensitive to structures that have edges perpendicular to the split direction; however, it is less sensitive to structures along the split direction. We developed a new detection scheme with an arrangement of light collecting fibers that removes this disadvantage and provides isotropic imaging while retaining all the advantages of offset aperture and split-detector imaging. The method is simple and any SLO system can be easily retrofitted to use this imaging configuration. Four optical fibers are arranged as a compact bundle. Split-detection analysis is performed using multiple combinations of the four offset images. Multiple split images highlight structural edges such as blood vessel walls along different directions and reveal extraordinary maps of capillaries. The phase and the phase gradient images are obtained from any pair of orthogonal split images and enable additional contrast mechanisms for identifying retinal structures. The imaging modality described here enables fundamental research essential for early detection, diagnosis, and quantification of retinal disease. AO-SLO imaging based on simultaneous acquisition of multiple offset aperture images provides an improved, isotropic image free of single offset-axis directionality artifacts. Cellular resolution in retinal imaging provides clinicians with the possibility to see the building blocks of retinal microstructures such as cone photoreceptors, rods, retinal pigment epithelium (RPE) cells, pericytes – associated to the vessel wall structure, ganglion cells, blood cells, the microvasculature, microaneurisms, or the retinal layers.

Biography:

Mircea Mujat, Principal Research Scientist.

Mircea Mujat received his PhD at the University of Central Florida, College of Optics and Photonics in 2004. He continued his activity as a Research Fellow with Harvard Medical School and Wellman Center for Photomedicine, Massachusetts General Hospital, and is currently a Principal Research Scientist with Physical Sciences, Inc. His current research interests include high resolution optical imaging (i.e., optical coherence tomography, optical frequency domain imaging, adaptive optics, phase contrast imaging, confocal and polarization microscopy), polarized light scattering, and biomedical applications of lasers. Mircea is SPIE and Optica Senior Member, and Optica Fellow.

Poster Presentation



Popa Cristina

National Institute for Laser Plasma and Radiation Physics, Romania

Respiration in Wavelengths using Laser Photoacoustic Spectroscopy System

Infrared gas spectroscopy is becoming most widely used in many life science applications. In this research we present a type of trace gas detection system based on a continuous wave (cw) CO₂ laser in combination with photoacoustic spectroscopy. Examples are included to expose the suitability of CO₂ laser system to monitor in near real time gases emission from various dynamic processes in human respiration. Relationships between the photoacoustic signal and gas pressure, laser power and gas concentration were measured and discussed in detail, respectively. The combination of photoacoustic spectroscopy and the CO₂ laser has resulted in simple, robust and easy to maintain designs which are giving photoacoustic spectroscopy a competitive advantage over other sensitive techniques. Applications from different field of life sciences demonstrate their potential for laboratory and field experiments, respectively. For detecting a single species, the CO₂ laser remains a powerful source especially in combination with photoacoustic spectroscopy.

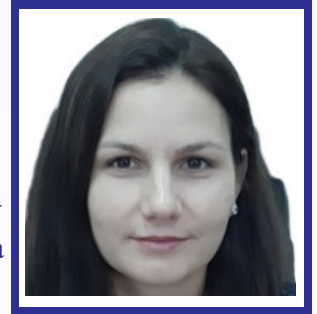
Acknowledgements This work was supported by the Romanian Ministry of Education and Research, under Romanian National Nucleu Program LAPLAS VII—contract n. 30N/2023 and contract no. TE 82/ 13.05.2022, PN-III-P1-1.1-TE-2021 -0717 (Human respiration in wavelengths).

Biography:

Dr. Cristina Popa is a Scientific Researcher 1st degree at National Institute for Lasers, Plasma and Radiation Physics, Laser in Life Sciences Environment and Manufacturing Laboratory from Romania. She works in the study of laser photoacoustic spectroscopy, optics, photonics and applications of CO₂ lasers in life sciences and environment. Graduated in Medical Physics in 2006, master in Biophysics and Medical Physics in 2008 with a PhD in Physics (2008-2011) in Bucharest University, Faculty of Physics. Post-Doctorate in University Polytechnic of Bucharest, Faculty of Applied Sciences, Department of Physics in 2015.

Bercu Mioara

National Institute for Laser Plasma and Radiation Physics, Romania



Laser Spectroscopy for The Assessment of Volatile Organic Compounds as Important Precursors for Secondary Pollutants

In recent decades, climate change has affected the whole world and important attention should be paid to the monitoring of volatile organic compounds (VOCs) which are important precursors of secondary pollutants such as ozone and secondary organic aerosols. Spatiotemporal variations and source apportionment are crucial for improving the understanding of atmospheric VOC chemistry and transport. In this work, we investigated soil-level VOCs such as ethylene, benzene, and toluene using a laser photoacoustic detector (LPAS) at three different locations (P1, P2, and P3) in a small town located in one of the most polluted areas in Romania, during the seasons of spring and summer in 2021. During the measurements, the maximum concentrations of benzene and toluene in the atmosphere were determined in location P1 located in a residential area with values of 1.573 ppb and 12.46 ppb, respectively, and the minimum concentrations were measured in location P2 located inside a forest and surrounded by heavily trafficked roads with values of 0.186 ppb and 1.01 ppb respectively. The minimum ethylene concentration determined by our system was 3.85 ppb at point P2, and the maximum concentration was 262 ppb at point P1. This behavior of pollutants with higher concentrations in summer compared to spring may be caused by climatic conditions, traffic, and the architecture of the area containing residential buildings. Also, ethylene, benzene, and toluene showed higher levels throughout the measurements in the first part of the day compared to those measured in the evening, this difference being caused by the production of the OH radical from the photolysis of ozone in the hottest hours of the day. The toluene/benzene ratio (T/B) was also determined, the values of which were approximately 3 and 4 in the spring season and greater than 5 in the summer season. This means that the presence of benzene and toluene in the atmosphere is due to traffic and industrial emissions. At the same time, a numerical model was adopted to evaluate the effect of greenery on the reduction of pollution in urban canyons. Some preliminary results obtained with reference to green areas show that a good reduction of pollutant dispersion in the canyon is possible.

Acknowledgements This work was supported by the Romanian Ministry of Education and Research, under Romanian National Nucleu Program LAPLAS VII—contract n. 30N/2023 and contract no. TE 82/ 13.05.2022, PN-III-P1-1.1-TE-2021 -0717 (Human respiration in wavelengths).

Biography:

Dr. Mioara Bercu (Petruș), with a 16-year career as a scientific researcher in the Laser Department, National Institute for Laser, Plasma and Radiation Physics, Romania was involved in research regarding photoacoustic spectroscopy sensing, laser photoacoustic spectroscopy device development gases analysis, biomarkers, oxidative stress, laser–soft tissue interaction, and numerical simulation.

Bratu Ana-Maria

National Institute for Laser Plasma and Radiation Physics, Romania



Effect of Long Term-storage on Internal Atmosphere of Organic and Conventional Commercial Fruits using Laser Spectroscopy

To deliver a good eating experience for consumers the dedicated effort spent in obtaining good fruit in the field must continue throughout storage. Only fruit that delivers a good eating experience will meet retailer specifications and drive consumer demand. Internal atmosphere management of fruit is very important because besides the well-known role of ethylene that plays a critical regulatory role in the process of fruit ripening, gases like oxygen, carbon dioxide, ethanol, acetaldehyde, ammonia, and water vapors have the potential to regulate the process of ripening individually and also in various interactive ways. Differences in the prevailing internal atmosphere of the fruits may therefore be considered as one of the causes behind the existing varietal variability of fruits in terms of rate of ripening, qualitative changes, firmness, shelf-life, ideal storage requirement, and susceptibility to various physiological disorders. The relation between ethylene ethanol, carbon dioxide, ammonia from the internal atmosphere of fruit can explain the exact regulatory role on various aspects of fruit ripening, and will facilitate the development of more meaningful, refined and effective approaches in postharvest management of fruits. Organic and Conventional commercial fruits were purchased from the supermarket, with uniform size and shape, without diseases, defects and physical damages. At commercial maturity were transported to the laboratory and were studied on 30 days period. As nitrate and pesticides may have had risk factor for health, during cultivation and storing the product should be properly monitored. The levels of nitrates and pesticides in Organic and Conventional commercial fruits were detected and the production of ethylene, ethanol, carbon dioxide and ammonia were investigated as a result of diverse physiological processes that varies due to crop maturity. For quality evolution of internal atmosphere of apples, we used a CO₂ laser-based photoacoustic spectroscopy device (LPAS) with high sensitivity and selectivity used to measure trace gases at parts-per million (ppm) or parts-per-billion level (ppb). Proper fruit storage is essential for maintaining the quality and safety of products during supply and distribution. Assessment in the endogenous volatile compounds from the fruit may demonstrate that the quality and quantity of volatiles may be linked to postharvest management of fruit.

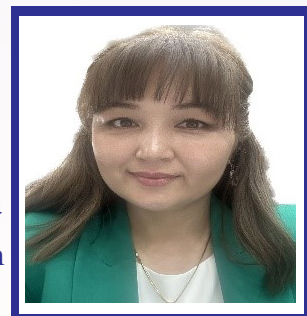
Acknowledgements This work was supported by the Romanian Ministry of Education and Research, under Romanian National Nucleu Program LAPLAS VI—contract n. 16N/2019 and contract no. TE 82/ 13.05.2022, PN-III-P1-1.1-TE-2021 -0717 (Human respiration in wavelengths).

Biography:

Ana-Maria Bratu received her PhD at Faculty of Applied Science from University Politehnica of Bucharest, Romania. Currently work as scientific researcher 3rd degree and her current research experience is in photoacoustics, laser-matter interactions, laser applications in medicine and biology, physics and technology of lasers.

Aiman Akylbekova

L.N. Gumilyov Eurasian National University, Astana, Kazakhstan



Formation of Semiconductor Nanocrystals based on Sulfide Zinc

In recent years, research on the application of optical properties of zinc sulfide has begun. Zinc sulfide is one of the most important semiconductor compounds of the AII-BVI group. Zinc sulfide-based nanostructures are used in medicine, optoelectronics, laser technology, QD-LED displays, etc. The aim of this work is to synthesize ZnS nanowires (NWs/NCs) using ion-track technology and to study the structural, morphological, and optical properties of the new nanostructures. The track templates were obtained by irradiation of a-SiO₂ with 200 MeV Xe ions to fluence 10⁷ – 10⁸ ion/cm² at the DC-60 cyclotron (Astana) and chemical etching in a 4% HF at RT. Chemical precipitation was performed using a chloride solution. SEM analysis showed that the number of filled nanopores was 90%. Zinc sulfide nanocrystals were formed by varying the time and temperature of solution. XRD (X-ray diffractometer D8 ADVANCE ECO) analysis showed the formation of ZnS nanocrystals in a-SiO₂/Si (p- and n-type) templates with a hexagonal crystal structure.

Biography:

Akylbekova Aiman Senior lecturer the L.N. Gumilyov Eurasian National University (ENU), Astana, Kazakhstan. The purpose of Akylbekova's visit is to take part in the conference with poster and discuss the possibilities of cooperation between the two countries.

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Global Summit on
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Web: <https://inovscitechconferences.com/23/rome/civilarchenveng/>

4th International Conference on
Aerospace, Mechanical and Mechatronics Engineering.
October 16-17, 2023.
Web: <https://inovscitechconferences.com/23/rome/mechengg/>

3rd International Conference on
Robotics and Artificial Intelligence.
October 16-17, 2023.
Web: <https://inovscitechconferences.com/23/rome/robartInt/>

5th Global Conference & Expo on
Nanoscience and Nanotechnology.
October 18-19, 2023.
Web: <https://inovscitechconferences.com/23/rome/nanscitech/>

Global Summit on
Nanomaterials and Applications.
October 18-19, 2023.
Web: <https://inovscitechconferences.com/23/rome/nanmatapp/>

Global Summit on
Chemical Engineering and Catalysis.
October 20-21, 2023.
Web: <https://inovscitechconferences.com/23/rome/cheengcat/>

6th International Conference on
Biopolymers and Polymer Chemistry.
October 20-21, 2023.
Web: <https://inovscitechconferences.com/23/rome/biopolychem/>

5th International Conference on
Applied Science, Engineering, and Technology.
October 20-21, 2023.
Web: <https://inovscitechconferences.com/23/rome/appsciengtech/>

Global Conference & Expo on
3D Printing & Additive Manufacturing.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/3d-printing/>

5th International Conference on
Aerospace, Mechanical and Mechatronics Engineering.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/mechengg/>

7th Global Conference & Expo on
Materials Science and Engineering.
April 22-23, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/matscieng/>

6th Global Conference & Expo on
Nanoscience and Nanotechnology.
April 22-23, 2024.
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2nd International Conference on
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International Conference on
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International Conference on
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Global Conference on
Public Health and Healthcare Management.
April 26-27, 2024.
Web: <https://inovscitechconferences.com/24/malaysia/public-health/>

Global Conference on
Nursing and Health Care.
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