Conference Program

Digest

The 8th International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale

IEEE 3M-NANO 2018

Hangzhou, China

13 – 17 August 2018

Organized by:

Zhejiang University, China

International Society for Nano Manipulation, Manufacturing and Measurement

Changchun University of Science and Technology, China

International Research Centre for Nano Handling and Manufacturing of China, China

IEEE Nanotechnology Council

Tampere University of Technology, Finland

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Sponsored by:

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Ministry of Education of the People's Republic of China

Research Executive Agency (REA), European Commission

Jilin Provincial Science & Technology Department

IFToMM (technically sponsored)

International Society for Nanomanufacturing

Greetings

On behalf of the organizing committee, it is our great pleasure and honor to welcome you in Hangzhou at IEEE 3M-NANO 2018 conference!

3M-NANO is an annual International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, held for the eighth time in Hangzhou. 3M-NANO covers advanced technologies for handling and fabrication on the nanoscale. The ultimate ambition of this conference series is to bridge the gap between nanosciences and engineering sciences, aiming at emerging market and technology opportunities. The advanced technologies for manipulation, manufacturing and measurement on the nanoscale promise novel revolutionary products and methods in numerous areas of application. Scientists working in different research fields are invited to discuss theories, technologies and applications related to manipulation, manufacturing and measurement on the nanoscale. IEEE 3M-NANO 2018 is proud to offer an excellent technical program containing 18 keynote talks on major conference topics delivered by distinguished researchers and around 200 presentations in parallel technical program.

Jong Min Kim
IEEE 3M-NANO 2018,
Honorary Chair

Jikui Luo
IEEE 3M-NANO 2018,
General Chair

Jianyi Yang
IEEE 3M-NANO 2018,
General Chair

A major goal of the IEEE 3M-NANO conference is to support a sustainable development of the nanohandling research community and to encourage long-term partnerships and collaborative research activities. To underline this dedication and to provide a get-together forum for all the participants, IEEE 3M-NANO 2018 has organized several exciting social events during and after the conference.

We would like to express our most sincere appreciation to all of our sponsoring organizations and all the individuals who have contributed to this conference. Our special thanks go to our colleagues in various conference committees and the volunteers who worked very hard to ensure the success of IEEE 3M-NANO 2018. Last but definitely not least, we thank all the conference participants for their support and contribution. We do hope that IEEE 3M-NANO 2018 will be the next successful step in this series of annual conferences and give home to rapidly growing nanohandling research community.

We wish you a successful conference and enjoyable stay in Hangzhou!

Table of Content

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Jin Zhang (CN)

Conference Information

Venue and Accommodation

Venue

Four Points By Sheraton Hangzhou, Binjiang located at south ramp of Qiantang River Bridge, No 868 Dongxin Avenue. The hotel has over 350 rooms including suites, and 6000 square-meters conference venue including a 650 square-meters and a 700 square-meters ballroom with 7.5 meter height, and other 18 meeting rooms.

868 Dongxin Avenue, Binjiang District, Hangzhou, Zhejiang

Phone: 0571-28878888

Fax: 0571-28878887

Email: fourpoints.com/hangzhou@fourpoints.com

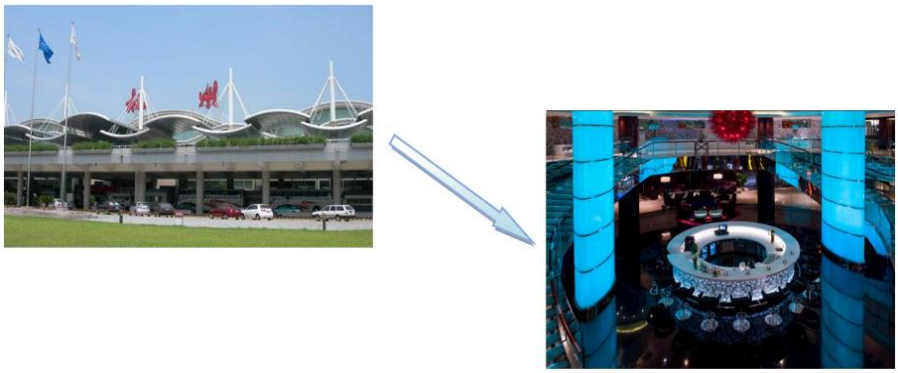
Website: www. fourpoints.com/Hangzhou

Accommodation

The accommodation of IEEE 3M-NANO 2018 is arranged in the Four Points By Sheraton Hangzhou, Binjiang.

How to get to Four Points By Sheraton Hangzhou, Binjiang (the venue of IEEE 3M-NANO 2018)

1. From “Xiaoshan International Airport” to “Four Points By Sheraton Hangzhou Binjiang”.



(1) By Taxi (around RMB 120).

(2) Airport shuttle bus to turn the subway (24 RMB).

Shuttle bus

Hangzhou Xiaoshan International Airport Station (airport bus Binjiang line)

MTR: Jiangling road Station (airport bus station)

Subway line 1

Jiangling road (Xiasha Binjiang direction)

Jinjiang road

Subway line 4

Jinjiang station (Puyan direction)

Yongjiang road

Nanxing bridge

Fuxing road

Shuicheng bridge

University of Chinese medicine

2. From “Hangzhou East Railway Station” to “Four Points By Sheraton Hangzhou Binjiang”.

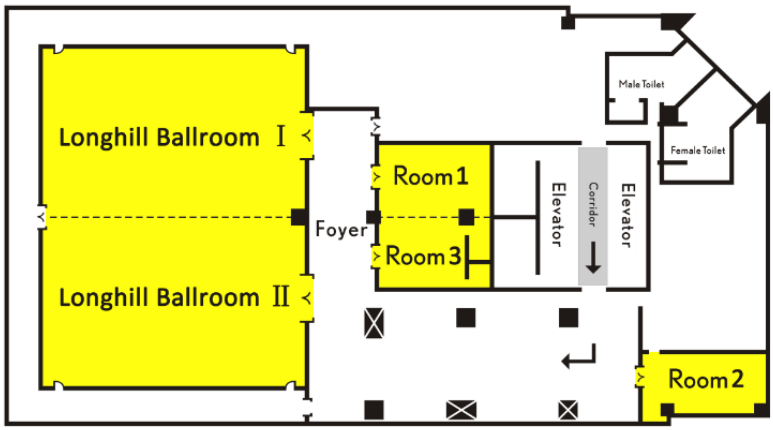
(1) By Taxi (around 70 RMB).

(2) Subway line 4 (5 RMB).

East rail station (along the river)
Xinfeng road
Xinfang road
Jingfang road
Qianjiang road
Jiangjin road
Civic center
Chengxing road
Jinjiang road
Yongjiang road
Nanxing bridge
Fuxing road
Shuicheng bridge
University of Chinese medicine

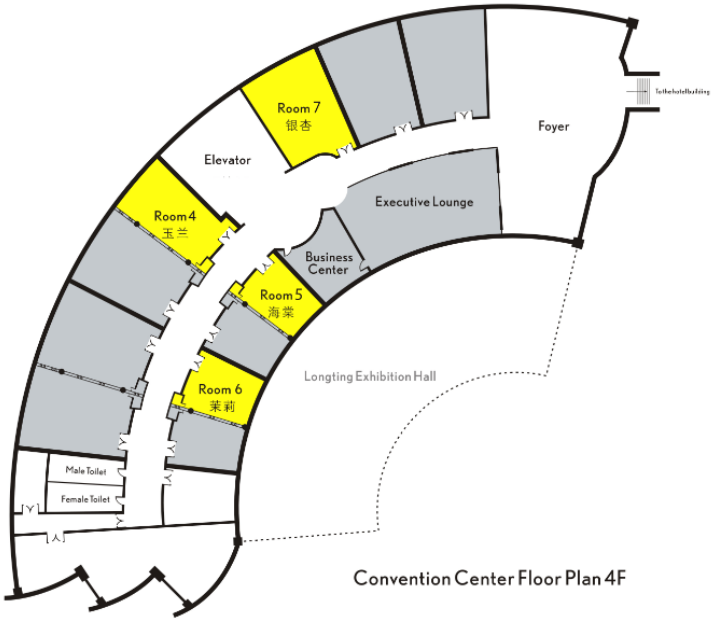
Floor Maps of Conference Rooms

3 F



Function Room Floor Plan 3F

4 F



Convention Center Floor Plan 4F

Conference registration will be arranged on the following days:

13 August, 13:00 – 18:00 **Four Points By Sheraton Hangzhou, Binjiang, 1F**

14- 16 August, 09:00 – 17:00 **Four Points By Sheraton Hangzhou, Binjiang, 3F**

IEEE 3M-NANO 2018 Program at a Glance

Monday, 13 August, 13:00-18:00, Four Points By Sheraton Hangzhou, 1F	
Registration	
Tuesday, 14 August, 8:00-17:00, Longhill Ballroom, 3F	
08:00—08:20	Opening ceremony
08:20—10:20	Keynote reports
10:20—10:40	Break
10:40—12:00	Keynote reports
12:00—14:00	Lunch
14:00—15:20	Keynote reports
15:20—15:40	Break
15:40—17:00	Keynote reports
17:00—20:00	Welcome banquet
Wednesday, 15 August, 8:00-10:20, Longhill Ballroom, 3F	
08:00—10:00	Keynote reports
10:00—10:20	Break
Wednesday, 15 August, 10:20-12:20, Rooms 1-6, 3-4F	
10:20—12:20	Parallel technical sessions
12:20—13:30	Lunch

Wednesday, 15 August, 13:30-17:50, Rooms 1-7, 3-4F	
13:30—15:30	Parallel technical sessions
15:30—15:50	Break
15:50—17:50	Parallel technical sessions
17:50—20:00	Conference dinner
Thursday, 16 August, 8:00-12:20, Rooms 1-7, 3-4 F	
08:00—10:00	Parallel technical sessions
10:00—10:20	Break
10:20—12:20	Parallel technical sessions
12:20—13:30	Lunch
Thursday, 16 August, 13:30-18:30, Longhill Ballroom, 3F	
13:30—15:30	Keynote reports
15:30—15:50	Break
15:50—17:50	Keynote reports
17:50—18:30	Closing ceremony
18:30—20:00	Farewell banquet
Friday, 17 August	
Social culture activities	

Schedule of the Keynote Reports

Tuesday, 14 August 2018, Longhill Ballroom, 3F

Time	Topic	Speaker
Session Chair: Adrian Neild		
08:20 – 09:00	Nanogenerator for Self-powered Systems, Io Ts, artificial Intelligence and Blue Energy	Zhonglin Wang
09:00 – 09:40	Formulation and Manufacturability of 2D Material Functional Inks and Devices	Tawfique Hasan
09:40 – 10:20	Functional Nanofibers	Seeram Ramakrishna
Session Chair: Tawfique Hasan		
10:40 – 11:20	Microfluidic Manipulation of Nanoparticles and Nanolitre Volume Droplets	Adrian Neild
11:20 – 12:00	Chemical Vapor Deposition Growth of Two Dimensional Materials for Electronic Devices and Energy Applications	Zhengtang Luo
Session Chair: Viktor Koledov		
14:00 – 14:40	Two-Dimensional Layered Materials for Nanoelectronics	Yang Chai
14:40 – 15:20	Beyond Nanoscale – A Next Generation Biocompatible Pathway for Analytical Bio-sensing and Cancer Diagnostics & Imaging	Krishnan Venkatakrishnan

Session Chair: Krishnan Venkatakrishnan		
15:40 – 16:20	Low Dimensional (0D, 1D, 2D) Devices for Future Electronics	Shunri Oda
16:20 – 17:00	Nano-Manipulation, Nano-Manufacturing, Nano-Measurements by New Smart Material-Based Mechanical Nanotools	Viktor Koledov

Wednesday, 15 August 2018, Longhill Ballroom, 3F

Time	Topic	Speaker
Session Chair: Santiago M. Olaizola		
08:00 – 08:40	In-situ Laser Interference Surface Patterning of Nanomaterials	Mark Hopkinson
08:40 – 09:20	Non-invasive Electromagnetic Guidance Schemes of Magnetic Nanoparticles for Drug Delivery to a Brain	Jungwon Yoon
09:20 – 10:00	SLM-based High-efficiency 3D Femtosecond Laser Microfabrication for Microoptical and Microfluidic Applications	Dong Wu

Thursday, 16 August 2018, Longhill Ballroom, 3F

Time	Topic	Speaker
Session Chair: Erkki Levanen		
13:30 – 14:10	Interregation of Cell Surface Dynamics by using Optical Manipulation and Thermoplasmonics	Poul M. Bendix
14:10 –14:50	Microrobotic Swarm: Reconfigurable Pattern Generation and Motion Control	Li Zhang
14:50 –15:30	Cavity-enhanced Nanophotonic Switching	Chaoyuan Jin
Session Chair: Poul M. Bendix		
15:50 – 16:30	Green, Supercritical CO_2 Assisted Processing of Functional Surfaces	Erkki Levanen
16:30 – 17:10	Flexible Electronics for Medical and Healthcare Applications	Jikui Luo
17:10 – 17:50	FBAR Devices for Gravimetric and Bio-Sensing Applications	Bill Milne

Keynote Speakers

(in alphabetical order)

Interregation of Cell Surface Dynamics by Using Optical Manipulation and Thermoplasmonics

Poul M. Bendix

Associate Professor

Niels Bohr Institute Physics
University of Copenhagen, Denmark

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Abstract: Investigations of cell surface dynamics is experimentally challenging due to the dynamic nature of nanoscopic surface structures having complex 3D shapes. The cell surface environment exhibits constant shape changes driven by molecular complexes in the membrane and by supporting cytoskeletal structures. Molecular shapes and cooperativity are emerging as important functional properties of cells to support formation of essential nanostructures on the cell surface. Membrane proteins with bent shapes can sense curvature cues and undergo crystallization at high density which could play a regulatory role in a number of cell functions and cellular disorders. Here, I will present quantitative studies on cell surface dynamics using optical force sensing and present a new thermoplasmonic technique for fusion of cells and for nanoscopic perturbation of the cell membrane. Plasmonic heating from optically trapped nanoheaters causes, in vivo-like, nanoscopic injuries to living cells and is paralleled by confocal microscopy to detect the molecular response. Optical manipulation, combined with protein expression in living cells and in isolated plasma membrane vesicles, allows us to quantify the correlation between molecular shapes and curvature sensing at the internal side of the plasma membrane. With these novel experiments, we gain a new understanding of the mechanisms governing cell surface protein dynamics and mechanical properties of the surface of living cells.

Two-Dimensional Layered Materials for Nanoelectronics

Yang Chai

Assistant Professor

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China
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Abstract: As the Moore's law is coming close to its end, the development of future semiconductor research requires low power and high performance nanoelectronics (More Moore) and diverse and multifunctional devices (More than Moore). It has been becoming inevitable to introduce new materials into the existing Si platform to augment its functions. Two-dimensional layered semiconductors possess ultrathin body, atomic scale smoothness, dangling bond-free surface, reasonable good mobility, and sizable bandgap, which enable promising applications in nanoelectronics. Recently, we used graphene as the barrier of the Cu interconnect to replace conventional TaN barrier. Our experimental and computational results show that graphene barrier can meet the ITRS requirement. We also reveal distinct growth dynamics of semiconducting MoS2 flakes using in-situ transmission electron microscopy, and demonstrate a systematic study on group-10 transition metal dichalocogenides.

Formulation and Manufacturability of 2D Material Functional Inks and Devices

Tawfique Hasan

Reader in Nanomaterials Engineering
Cambridge Graphene Centre
University of Cambridge
UK
E-mail: th270@eng.cam.ac.uk

Abstract: Beyond graphene, non-carbon two-dimensional (2D) crystals have recently shown huge promises for applications in a wide range of optoelectronic devices. Solution processability of these materials offers an exciting opportunity when applications with large form factors are envisaged. As an inevitable extension to the requirements of solution processability, the ability to formulate their functional inks is of paramount importance for large-scale device manufacturability. I will introduce inkjet printable ink formulation of graphene, transition metal dichalcogenides (TMDs) and black phosphorus (BP). First, I will briefly discuss printed sensors and flexible thermoelectric generators using inkjet printed graphene. For TMDs and BP, I will demonstrate the importance of using a mixed solvent approach in ink formulation to achieve excellent print quality. This, in addition to the choice of solvents enable reliable inkjet printing for scalable device development, even for wafer-scale device arrays. Our approach to formulate these functional inks could also be exploited to develop functional inks of other 2D materials for large-scale manufacturability.

In-situ Laser Interference Surface Patterning of Nanomaterials

Mark Hopkinson

Professor
Department of Electronic and Electrical Engineering
University of Sheffield
UK
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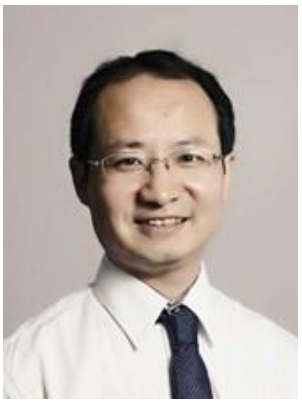
Abstract: The development of new methods for the production of large scale arrays of identical nanostructures is of vital importance for the future development of electronic, photonic and biological materials. The conventional methodology of lithographic processing and etch has served us well for many decades, but is now becoming compromised by economic and technology limitations as we seek sub-10nm dimensions. As an alternative approach, self- assembly methods have shown the capability to form nanostructures with well-defined properties and novel functionality (eg: quantum dots). However, the lack of size selectivity and site control is a major limitation of such approaches. To progress with self-assembly, we require in-situ methods which can control the nucleation site to produce an addressable ensemble of structures with identical structure.

The presentation will review work performed under the EU program Nanostencil3on the in-situ laser interference processing of materials. Our approach is based on the well-established potential of laser interference lithography to pattern a regular grid in a single pulsed exposure. The project seeks to apply this approach to materials processing reactors within which we interact with the surface at the materials formation stage. The methods include Molecular Beam Epitaxy, Chemical Vapour Deposition and surface oxidation reactions. We seek to nucleate self-assembled nanostructures at precise sites patterned by interferometric light by exploiting the photothermal photochemical modification of the surface. The talk will discuss the potential of this method and early stage proof of principle of its potential.

Cavity-enhanced Nanophotonic Switching

Chaoyuan Jin

Professor
College of information Science & Electronic Engineering
Zhejiang University
China
E-mail：jincy@zju.edu.cn



Abstract: The power consumption of signal switching/routing is considered to become a serious bottleneck in scaling up the bandwidth for short-reach communications. The development of high-performance, energy-efficient photonic devices is therefore crucial in tackling this problem. To achieve the energy efficient goal, we have reviewed the fundamental limitation of semiconductor-based switching devices and find out there are general ways to further scale down the energy consumption at ultrafast operation speed, for example, by increasing the field confinement of photonic cavities, leading to the ultrafast control of cavity quantum electrodynamics. Recent demonstrations of nanostructure-based photonic devices are discussed with a particular focus on the real-time control of cavity field, which provides an extra degree of freedom to manipulate radiative processes which are key to classical and quantum photonic devices. In quantum information systems based on photon exchange between semiconductor-based quantum nodes, the processes of photon emission and absorption is controlled in a time-scale shorter than the radiative lifetime. In nanophotonic devices, ultrafast laser sources and photonic switches are either demonstrated by controlling the carrier dynamics in semiconductors or by the ultrafast modulation of cavity properties.

Nano-Manipulation, Nano-Manufacturing, Nano-Measurements by New Smart Material-Based Mechanical Nanotools

Viktor Koledov

Professor
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Magnetic Phenomena Laboratory
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Abstract: Recent progress in the study of new functional materials, such as Ti(NiCu) intermetallic with shape memory effect (SME), opens up exciting possibilities for the design reconfigurable micro- and nano-structures and for operating mechanical nanotools controlled by external fields or heat. This report gives an overview of physical effects, in particular, solid state phase transitions and accompanying phenomena in alloys and composites exhibiting SME. The limitations pertaining to the minimum size of the nanomechanical devices exhibiting shape memory effect that arise due to the solid state phase transitions are now under discussion and have not been completely understood yet. The modern nanotechnologies allow designing of the mechanical micro- and nanotools, such as nanotweezers, nanopinchers etc., with an active layer thickness of about several tenths of nm, and whose overall size is below 1 μm. The nanotools with SME can be controlled by heating as well as by magnetic field activation in ferromagnetic alloys exhibiting SME, such as Ni2MnGa. 3D nanomanipulation is demonstrated by composite nanotweezers with SME in different nanoobjects, such as CNTs, nanowires, nanowhiskers, bionanoobjects, DNA, etc. In these devices, the surface interactions and Casimir and van der Waals forces affect the process of nanomanipulation. The prospects of nanorobotics and manufacturing on nanoscale adapting the principle of mechanical bottom-up nanoassembly are discussed. In addition, nanoscale measurements can take advantage of 3D mechanical nanomanipulation, including transportation of analytes to nanosensors, elasticity measurements by nanotools with calibrated force, etc.

Green, Supercritical CO_2 Assisted Processing of Functional Surfaces

Erkki Levanen

Professor
Head of Research Group
Tampere University of Technology
Finland
E-mail：erkki.levanen@tut.fi

Abstract: There is urgent need for manufacturing of complex structures and large surfaces with sustainable ways and supercritical CO2 assisted processing techniques will offer one promising way to produce ceramic nanoparticles and well-defined ordered structures and surface topographies. TiO2 and Zn-based materials are possible to produce by hybrid manufacturing technologies combining e.g. sol-gel, ablation and chemical growth in CO2 environment. This study sustainable manufacturing routes of functional ceramics and their structure and properties.

Flexible Electronics for Medical and Healthcare Applications

Jack (Jikui) Luo

Professor
Institute for Materials Research and Innovation
The University of Bolton
UK
E-mail：J.Luo@bolton.ac.uk

Abstract: Flexible electronics is an emerging technology, that can be applied to a range of biomedical and wearable applications. Flexible electronics possesses some unique properties such as excellent conformability, stretchability and wearability that rigid electronic counterparts are unable to provide. Owing to its great potential for widespread applications, many flexible electronic devices and technologies have been developed and their applications been explored.

This talk will introduce a number of flexible electronic technologies we developed, including stretchable/bendable skin-like sensors for touch/strain/force/temperature detection; flexible planar ECOG with hundreds of electrodes; wearable wireless sensor chips etc for biosensing, implant and wearable applications; and unique flexible surface acoustic wave (SAW) resonators and film bulk acoustic resonators (FBAR) for biosensing and microfluidics applications. The skin-like sensors possess multiple-sensations for temperature, touch, pressure and shape with the pressure sensitivity better than human skins, and those finger-type flexible sensors can fit on the fingers of a robot to perform force-feedback gripping and objective separation etc. SAW on rigid piezo-substrate has utilized in microfluidics/lab-on-chip applications to transport/mix pl- l volume liquids, generate droplets, perform cell separation/identification, cell lysis with excellent result, while the new flexible acoustic resonator sensors are able to perform some of the functions under a bending condition with high sensing sensitivity that are compatible to or better than those of rigid counterparts, showing a great potential for applications in environmental and health monitoring, performance enhancement etc.

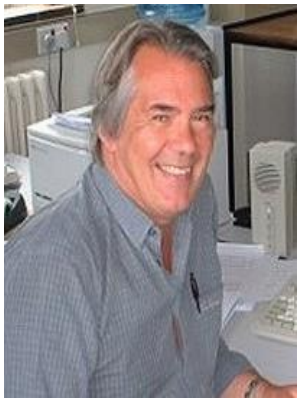
Chemical Vapor Deposition Growth of Two Dimensional Materials for Electronic Devices and Energy Applications

Zhengtang Luo

Assistant Professor
Department of Chemical & Biological Engineering
Hong Kong University of Science and Technology, China
E-mail: keztluo@ust.hk

Abstract: The discovery of graphene has promoted an extensive research on a variety of two-dimensional materials comprising hexagonal boron nitride (h-BN), transition metal dichalcogenides (TMDs) and others, which expanded the 2D materials family over the years. Consequently, the 2D materials family provides a wide flavor of electronic properties generating wide bandgap insulators, semiconductors, semimetals and metals. Therefore, the unique characteristics of 2D materials urge them as potential candidate for a broad spectrum of applications including optoelectronic devices, biosensing, electrocatalysis and many others. Our research group has been working on the synthesis and functionality of these 2D materials for a substantial time period. In this talk, I will present our recent work on the carbon gettering approach for chemical vapor deposition (CVD) growth of high-quality millimeter sized single crystal graphene for the optoelectronic applications. Further, I will discuss the CVD growth of a variety of TMDs materials and their heterostructures, which we have demonstrated to have great potential for photodetectors and other energy related applications.

FBAR Devices for Gravimetric and Bio-Sensing Applications



Bill Milne

Emeritus Professor
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University of Cambridge
UK
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Abstract: This talk will describe the design and development of Gravimetric and Biological Sensors based on thin Film Bulk Acoustic Resonator (FBAR) Technologies. The FBAR devices were fabricated mostly on ZnO nanocrystalline thin films deposited using a novel High Target Utilisation Sputtering System (HiTUS). The system ensures that we can produce low stress films at the high deposition rates necessary for such structures to operate efficiently. We will describe gravimetric sensors based on such sensors, and end with a description of our more recent results on dual mode thin film FBARs for parallel sensing of both mass loading and temperature.

Microfluidic Manipulation of Nanoparticles and Nanolitre Volume Droplets

Adrian Neild

Professor and Australian Research Fellow
Director of Research
Department of Mechanical and Aerospace Engineering
Monash University
Australia
E-mail: adrian.neild@monash.edu

Abstract: Surface acoustic waves have proved a very promising way to interact with fluid enclosed in microfluidic systems. The coupling of sound waves into the fluid, from a piezoelectric substrates, allows forces to be exerted on suspended matter, fluids and interfaces, these allow tasks such as cell patterning, fluid mixing and droplet generation to be performed. In this work, the potential for controlling droplets in a microfluidic network will be explored, performing such tasks as droplet steering, merging and subdivision. In addition the nature of the interaction of such waves with particles of different sizes will be examined, giving new incite into the nature of the sound fields created and their potential for capturing nanoparticles.

Low Dimensional (0D, 1D, 2D) Devices for Future Electronics

Shunri Oda

Professor
Tokyo Institute of Technology
Japan
E-mail: oda.s.ab@m.titech.ac.jp

Abstract: One of the major application targets for future electronics is wearable communication tools with low-power consumption. Tunnel field-effect-transistors (TFET) are promising since extremely low-voltage operation of switching beyond the limitation of CMOS devices would be possible. 2D materials and 1D nanowires attract attention not only because these materials would be suitable for the fabrication of TFETs, but also various novel application such as sensors, displays would be possible. Quantum computing is no longer a future technology. Recent advances in D-Wave computers based on quantum annealing and superconducting devices, and the demonstration of long spin decoherence times in isotopically-enriched Si qubits, have accelerated the research and development of this technology. The remaining challenge is large scale integration of qubits. Physically-defined coupled quantum dots (QDs) on silicon-on-insulator substrates are promising for multiple scaled qubits. In this paper, we discuss recent progress of 0D (quantum dots), 1D (nanowires) and 2D atomic-layer materials devices.

Functional Nanofibers

Seeram Ramakrishna

Professor
Director
Center for Nanofibers & Nanotechnology
National University of Singapore
Singapore
E-mail: seeram@nus.edu.sg

Abstract: Product innovations as well as manufacturing innovations are closely related to the materials innovations. Together they enable better living – clean air, water and energy, health and wellbeing, smart living and transportation, safety and security, and circular economy. Functional nanomaterials and materials informatics are emerging domains of materials innovation. Electrospinning has been developed as a viable manufacturing method for producing a range of nanofibers and nanoparticles of polymers, metals, ceramics, carbon, and their combinations. It has also evolved into a 3D printing or additive manufacturing method. Functional nanomaterials enable air filtration, water purification, clean energy generation and storage, controlled drug delivery, tissue engineering, regenerative medicine, food packaging, high performance apparel, electronic-skin, wearables, and light-weight, damage tolerant materials for transportation, electricity transmission, buildings and construction. They also enable self-cleaning, super-hydrophilic, super-hydrophobic, and anti-microbial surfaces. Materials Informatics approach based on advances in machine learning is developed to mine properties of nanomaterials. This lecture provides an overview, and discusses emerging opportunities.

Beyond Nanoscale – A Next Generation Biocompatible Pathway for Analytical Bio-sensing and Cancer Diagnostics & Imaging

Krishnan Venkatakrishnan

Professor
Department of Mechanical and Industrial Engineering
Ryerson University
Canada
E-mail: venkat@ryerson.ca

Abstract: Quantum/ Nano scaled materials engineered with multi-photon ionization interaction can be programmed to generate multiple phased structures as well as varied morphologies in order to obtain unique optical and biochemical properties that have never been observed before. Using femtosecond laser ablative synthesis, the quantum and nano materials was created for ultrasensitive cancer diagnostics, label-free fluorescence imaging as well as cancer therapy. The materials are able to behave like an extra-cellular matrix for cell adhesion and proliferation for in-vitro analysis. Our focus is to synthesize bio-compatible and non-plasmonic materials like silicon, graphene, nickel, titanium, zinc etc. Current study focuses on the apoptotic pathways on cancer cells and the selective behavior of the materials, which allow enhancement of proliferation for fibroblasts. Substantial SERS enhancement was obtained from the typically non-Raman active materials. Single cell level sensitivity was achieved and biomolecules like DNA, RNA, Proteins, lipids of alive cell was detected. In addition, the femtosecond laser synthesized three dimensional structures show very high quantum yield. A label free fluorescence imaging platform was developed thanks to the enhanced absorption and fluorescence throughput of the quantum structures. Our research in this direction may open up new possibilities for ultra-sensitive cancer diagnosis.

Nanogenerator for Self-powered Systems, IoTs, Artificial Intelligence and Blue Energy

Zhonglin Wang

Professor
Beijing Institute of Nanoenergy and Nanosystems
Chinese Academy of Sciences, China
School of Materials Science and Engineering
Georgia Institute of Technology
USA

Abstract: Self-powered system is a system that can sustainably operate without an external power supply for sensing, detection, data processing and data transmission. Nanogenerators (NG) were first developed for self-powered systems based on piezoelectric effect and triboelectrification effect for converting tiny mechanical energy into electricity, which have applications in internet of things, environmental/infrastructural monitoring, medical science, environmental science and security. Here, we first present the fundamental theory of the NGs starting from the Maxwell equations. In the Maxwell's displacement current proposed in 1861, the term E $\partial E/\partial t$ gives the birth of electromagnetic wave, which is the foundation of wireless communication, radar and later the information technology. Our study indicates that, owing to the presence of surface polarization charges present on the surfaces of the dielectric media in NG, an additional term $(\partial P\_s)/\partial t$ should be added in the Maxwell's displacement current, which is the output electric current of the NG. Therefore, our NGs are the applications of Maxwell's displacement current in energy and sensors. NGs have three major application fields: micro/nano-power source, self-powered sensors and blue energy. We will present the applications of the NGs for harvesting all kind mechanical energy that is available but wasted in our daily life, such as human motion, walking, vibration, mechanical triggering, rotating tire, wind, flowing water and more. Then, we will illustrate the networks based on triboelectric NGs for harvesting ocean water wave energy, for exploring its possibility as a sustainable large-scale power supply. Lastly, we will show that NGs as self-powered sensors for actively detecting the static and dynamic processes arising from mechanical agitation using the voltage and current output signals.

SLM-based High-efficiency 3D Femtosecond Laser Microfabrication for Microoptical and Microfluidic Applications

Dong Wu

Professor
Micro & Nano Engineering Laboratory
School of Engineering Science
University of Science and Technology of China
China
E-mail: dongwu@ustc.edu.cn

Abstract: Femtosecond laser induced two-photon polymerization (TPP) has been proved to be a powerful microfabrication technique with high efficiency and quality. However, the main drawback of TPP technique is its low fabrication efficiency caused by the point-to-point raster scanning strategy, which seriously restricts its applications. In order to overcome the disadvantages, SLM-based (spatial light modulator) 2D-3D laser intensity patterns (e.g., mutlifoci or arbitrary patterns) were proposed to significantly speed up the fabrication process by serveral orders of magnitude, and has a wide range of applications in optics, micromachines, and biology, owing to its capability to dynamically update the intensity distributions in the focal plane by modifying the phase of incident light. A series of 2D-3D functional microdevices such as Damman grating, microfilter and flower-like microtube arrays were rapidly fabricated and show various functions, such as beam splitting, particles filtering and cell manipulation.

Non-invasive Electromagnetic Guidance Schemes of Magnetic Nanoparticles for Drug Delivery to a Brain

Jungwon Yoon

Associate Professor
School of Integrated Technology
Gwangju Institute of Science and Technology (GIST)
Korea
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Abstract: Electromagnetic sensing and guidance schemes using magnetic nanoparticles(MNPs) can allow a nanotechnology-based drug delivery approach to be feasible for potential therapies for neurodegenerative diseases such as Alzheimer's disease. In this talk, I will introduce an electromagnetic guidance scheme of magnetic nanoparticles without particles' aggregation to deliver them to a brain efficiently, then show how the magnetic particle imaging (MPI) scheme for the particles' monitoring can be combined with the electromagnetic guidance scheme. The proposed guidance approaches can be adapted to a medical robotic platform for brain drug targeting, brain stimulation, and brain hyperthermia.

Microrobotic Swarm: Reconfigurable Pattern Generation and Motion Control

Li Zhang

Associate Professor
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong (CUHK)
Hong Kong SAR
China
E-mail: lizhang@mae.cuhk.edu.hk

Abstract: To control a swarm of microrobots with external fields is one of the major challenges for untethered microrobots. In this talk, I will present generation of reconfigurable paramagnetic nanoparticle based microswarm, using dynamic magnetic fields. The nanoparticle swarm exhibits a dynamic-equilibrium structure, in which the nanoparticles perform synchronised motions in fluid. By tuning the input parameters of the dynamic magnetic field, the pattern of the magnetic swarm is capable of performing reversed transformation, such as swelling and shrinkage. Moreover, reversible merging and splitting of the swarms are demonstrated and investigated. Serving as a mobile robotic end-effector, the swarm is capable of making locomotion by tuning the pitch angle of the actuating field. In addition, localized delivery will be demonstrated. Finally, the opportunities and challenges of magnetic microrobotic swarm for biomedical applications will be discussed.

Technical Program

(ss: Technical Special Session)

Wednesday, 15 August 10:20-12:20

No.	Room	Session
01	Room 1	Optical Device and Optical Spectrum (ss)
02	Room 2	Nanoscale Light Manipulation in Photonic Structures/Materials (ss)
03	Room 3	Ferroelectrics at Nanoscale：from Fundamentals to Applications (ss)
04	Room 4	FabSurfWAR (ss)
05	Room 5	Micro/nano Structure Measurement Applied in Environmental Science (ss)
06	Room 6	Nanomaterials and Nanofluidics

Wednesday, 15 August 13:30-15:30

No.	Room	Session
07	Room 1	Nanomaterial and Nanotechnology for Biological Applications (ss)
08	Room 2	Laser based Submicro and Nanoprocessing (ss)
09	Room 3	Nano Fabrication and Manipulation of Flexible Electronics (ss)
10	Room 4	Micro/Nano Robotics for Single Cancer Cells

		(MNR4SCell) (ss)
11	Room 5	Nanomaterials for Energy and Environmental Applications (ss)
12	Room 6	Nanoposition and Nanomanipulation
13	Room 7	Functional Materials for Bottom up Nano-assembly (ss)

Wednesday, 15 August 15:50-17:50

No.	Room	Session
14	Room 1	Surface Analysis and Application of Functional Nanomaterials (ss)
15	Room 2	Nano Stencil (ss)
16	Room 3	Insect Flight and Bionic MAV Wings (ss)
17	Room 4	Nano Optoelectronic Materials and their Applications for Biosensing and Biological Detection (ss)
18	Room 5	Manufacturing and Measurement of Micro/Nano-Scale Optical Waveguides (ss)
19	Room 6	Nanosensor and Bioelectronics (ss)
20	Room 7	Functional Materials for Bottom up Nano-assembly (ss)

Thursday, 16 August 8:00-10:00

No.	Room	Session
21	Room 1	University of Shanghai Cooperation Organization Nanotechnology (ss)

22	Room 2	NEMS and their Applications
23	Room 3	Fiber-based Elements and Nonlinear Optics (ss)
24	Room 4	Nanofabrication and Nanocharacterization
25	Room 5	Micromachines and Devices (ss)
26	Room 6	2D Materials at Nanoscale: from Fundamentals to Applications (ss)
27	Room 7	Micro/nano Materials and Structures for Photonics and Quantum Optics (ss)

Thursday, 16 August 10:20-12:20

No.	Room	Session
28	Room 1	Design and Application of Piezoelectric Actuators (ss)
29	Room 2	Design, Analysis and Control of Micro-/nano-manipulating Systems (ss)
30	Room 3	Nanoelectronics and Nanophotonics
31	Room 4	Biological Applications
32	Room 5	Nanofabrication and Nanocharacterization
33	Room 6	2D Materials at Nanoscale: from Fundamentals to Applications (ss)
34	Room 7	Nanosensing and Microscopy

Technical Special Session 01
Optical Device and Optical Spectrum (ss)

Room 1

10:20–12:20 Wednesday, 15 August

Organizer: Yi Qiu

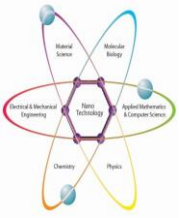
Co-Chair: Shuxin Du

01-1 10:20–10:40

Overview of the development of modern NANO technology.

Isbat Mahin
Mechatronics Engineering, Huzhou University, China.

- An application of Nanotechnology in various fields such as health & medicine, electronics, energy & environment.
- Nano materials can be classified dimension wise into different categories.
- Nanotechnology is helping to create ultra-dense memory that allow us to store this wealth of data.
- Nanotechnology is playing a further role in aircraft, nuclear power and space exploring.



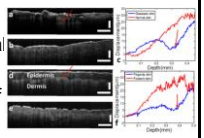
Notes

01-2 10:40–11:00

Optical coherence elastography based on adaptive Doppler analysis for material characterization

X. Liu, F. R. Zaki, H. Wu, C. Wang, and Y. Wang
Department of Electrical and Computer Engineering, New Jersey Institute of Technology, United States

- Optical coherence elastography (OCE) can be used to characterize the mechanical properties of a material noninvasively with high spatial and temporal resolution.
- OCE tracks the motion at different spatial location of the sample through Doppler analysis to reveal the mechanical contrast of the sample
- To robustly track the motion that has a non-constant magnitude over time and space, an adaptive Doppler analysis method has been developed and validated.



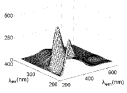
Notes

01-3 11:00–11:20

Support tensor machines for high-order spectroscopy analysis

Shuxin Du
College of Engineering, Huzhou University, P.R.China

- Report high-order spectral data analysis methods based Support Tensor Machines
- Keep the inherent high-order structural property of the data
- Not require a pre-determined number of components of the calibration model
- Applied to analyzing any spectral data of any order without increasing the computational cost and the complexity of the data model
- Experiment estimating the chemical oxygen demand (COD) and total organic carbon (TOC) in water by using fluorescence excitation-emission matrices (EEM)



Fluorescence EEM spectroscopy

Notes

Technical Special Session 01
Optical Device and Optical Spectrum (ss)

Room 1

10:20–12:20 Wednesday, 15 August

Organizer: Yi Qiu

Co-Chair: Shuxin Du

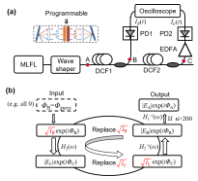
01-4 11:20–11:40

Performance of the time-stretch scheme for ultrafast full-field information characterization

Chi Zhang

Wuhan National Laboratory for Optoelectronics,
Huazhong University of Science and Technology, China

- Multi-step time-stretch scheme with an iterative retrieval algorithm for the ultrafast full-field information characterization
- Perform this ultrafast full-field information characterization of the ultrashort pulse (e.g. 4.4 ps)
- Explore system performance in detail by adopting different temporal dispersions and initial conditions



Implementation of the multi-step time-stretch scheme with an iterative retrieval algorithm.

Notes

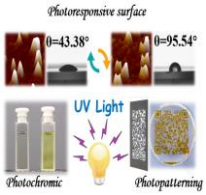
01-5 11:40–12:00

Triarylethylene Derivatives - A New Photochromic System With Simple Chemical Structures

Tao Yu

School of Chemistry, Sun Yat-sen University, China

- A new photochromic system with simple chemical structures-TrArE was discovered.
- The TrArE show good photochromic properties.
- Reversable photopatterning could be fulfilled by doping them in polymer films.
- In-situ nano-sized morphology controls could be realized based on these materials.



Notes

Technical Special Session 02
Nanoscale Light Manipulation in Photonic Structures/Materials (ss)

Room 2

10:20–12:20 Wednesday, 15 August

Organizer: Hua Lu

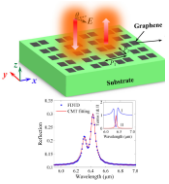
Co-Chair: Yongkang Gong

02-1 10:20–10:40

Plasmonic Manipulation and Applications in Nanostructures/Nanomaterials

Hua Lu
School of Science, Northwestern Polytechnical University, China

- Flexible and tunable induced transparency with high-quality factor was realized in the plasmonic systems.
- Fano spectral response from graphene plasmonic metasurfaces was observed in the mid-infrared region.
- The 37-fold enhancement of light absorption in monolayer graphene was realized by Tamm state in optical thin films.
- Visible-range surface plasmon resonance was generated in the Sb_2Te_3 topological insulator.



Graphene metasurface and spectral response

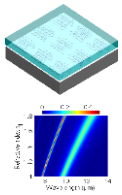
Notes

02-2 10:40–11:00

Tunable Plasmon Response of Thin-film Black Phosphorus

Renlong Zhou
School of Physics and Information Engineering, Guangdong University of Education, China

- We investigated the confinement and lifetimes of tunable surface plasmons in nanostructured black phosphorus nanoflake with superstrate.
- The intensity, wavelengths and width of resonance modes can be precisely controlled with the fermi energy, scattering rate, side length, and superstrate.
- It is useful for study of the absorption, lifetime, and nonlinear optical processes in black phosphorus based sensing application.



The absorption with superstrate refractive index

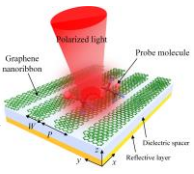
Notes

02-3 11:00–11:20

Cavity-enhanced Graphene Plasmonic for Surface-enhanced Infrared Spectroscopy

Wei Wei
Key Laboratory of Optoelectronic Technology & System, Ministry of Education of China, College of Optoelectronic Engineering, Chongqing University, China

- A micro cavity is constructed to improve the excitation efficiency of graphene plasmons
- Stack double layer graphene is used to increase doping level
- Graphene plasmonic mode is adjusted to spectrally match the desired molecular vibrational mode.
- Vibrational signal of molecules is larger for higher efficiency of graphene plasmons



Schematic of the cavity-enhanced graphene plasmonic resonator

Notes

Technical Special Session 02
Nanoscale Light Manipulation in Photonic Structures/Materials (ss)

Room 2

10:20–12:20 Wednesday, 15 August

Organizer: Hua Lu

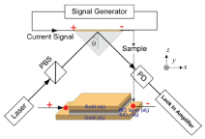
Co-Chair: Yongkang Gong

02-4 11:20–11:40

Active Control of Light Using Magnetoplasmonics

Yongkang Gong, kang Li and Nigel Copner
Faculty of Computing, Engineering and Science, University of South Wales, UK

- We proposed a scheme that allows for active control of light by utilizing the nonreciprocal magnetoplasmonic effect.
- We applied current signal through an ultrathin metallic film in a magnetoplasmonic multilayer
- Dynamic photonic nonreciprocity appears in magnetic-optical material layer
- The concept could find potential applications such as ultrafast optoelectronic signal processing



Experimental setup for the magnetoplasmonic based current modulation of light

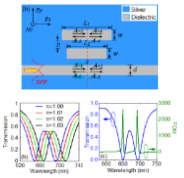
Notes

02-5 11:40–12:00

Nano-sensor based on Plasmon induced Transparency in Coupled Waveguide Systems

Zhihui He
School of Physics and Electronic Information, Yan'an University, China

- Background
- Normal sensing characteristics in coupled waveguide systems
- Sensing characteristics enhanced by slow-light effects in PIT systems
- Summary



Notes

02-6 12:00–12:20

Site-control and Mass-production 5 nm Nanogap Electrodes by Laser Direct Writting Lithography

Yuanqing Huang[1], Xu Wang[1], Feng Xia[2], Yong Peng[3], Qian Liu[4] and Ziyang Zhang[1]
1. Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences; 2. Qingdao University; 3. Lanzhou University; 4. National Center for Nanoscience andTechnology.

- Nanoscale integrated photonic circuits and systems are vital part of future computers, information systems and molecular-based devices making the world even "faster" and "smaller".
- The rapid development of semiconductor technology leads to unprecedented level of integration of photonic devices with feature sizes down to nanoscale.
- In this paper, we describe the development of a laser direct writing (LDW) lithography technique with ~5 nm feature size, which is far less than the optical diffraction limit of 405 nm GaN laser, on a SiO 2 /TiO 2 bilayer thin film, and the realization of 5 nm nanogap electrodes with large ON/OFF ratio of ~1.4*10 ^{5} .
- This LDW lithography also exhibits a very attractive nano-fabrication capability of well site-control and mass-production of ~5*10 5 nanogap electrodes per hour .
- Our results establish that such simple, low cost and effective lithography technology has great potential to fabricate nanomaterials and nanodevices for compact integrated photonic circuits, optics and biochips.

Notes

Technical Special Session 03
Ferroelectrics at Nanoscale：from Fundamentals to Applications (ss)

Room 3

10:20–12:20 Wednesday, 15 August

Organizer: Xiangzhong Chen

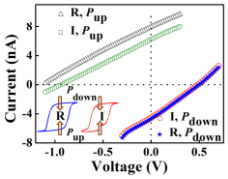
Co-Chair: Xiaoshi Qian

03-1 10:20–10:40

Polarization Imprint and Photovoltaic Effect in $Pb(Zr,Ti)O_3$ Thin Films

Zhen Fan
Institute for Advanced Materials, South China Normal University, China

- Positive (negative) DC poling causes the polarization imprint (rejuvenation).
- In P_{up} state, the imprinted capacitor exhibits degraded PV properties compared with the rejuvenated one.
- In P_{down} state, the rejuvenated capacitor enters the imprinted state spontaneously.
- An imprint model comprising oxygen vacancies and trapped electrons modulated by polarization, voltage, and illumination, is proposed.



Notes

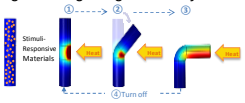
03-2 10:40–11:00

Intelligent Functional Materials for Advanced Active and Passive Thermal Management

Xiaoshi Qian, Junye Shi, Jiangping Chen
School of Mechanical Engineering, Shanghai Jiang Tong University, China

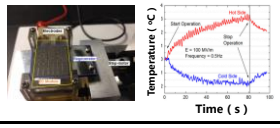
Electrocaloric Cooling Technology

1. A solid-state cooling agent made of ferroelectric polymers
2. Facile tuning of material properties from nano- micro-meso scales
3. Rich fundamental science unexplored
4. From material sciences to device engineering



Bio-inspired Artificial Tropistic Materials

1. Bio-inspired spontaneous locomotion with self-awareness
2. Tightly self-regulated material system enabling the artificial phototropism
3. Benefits in fields of energy harvesting
4. Demonstration in practical applications.



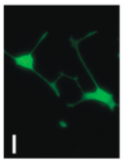
Notes

03-3 11:00–11:20

Integration of ferroelectric materials in microdevices for cell stimulation

Xiangzhong Chen, Marcus Hoop, Fajer Mushtaq, Bradley J. Nelson, Salvador Pané
Multi-Scale Robotics Lab (MSRL), Institute of Robotics and Intelligent System
Swiss Federal Institute of Technology (ETH) Zurich, Switzerland

- Microrobots are emerging candidates for targeted therapeutic interventions.
- The implementation of piezoelectric building blocks can help develop highly-integrated small-scale machines.
- These magnetoelectric micro devices can wirelessly generate electric output.
- These micro devices find applications in cell electrostimulation and transportation.



Neuron-like cells differentiated by electrostimulation

Notes

Technical Special Session 03
Ferroelectrics at Nanoscale：from Fundamentals to Applications (ss)

Room 3

10:20–12:20 Wednesday, 15 August

Organizer: Xiangzhong Chen

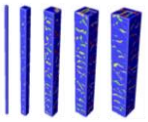
Co-Chair: Xiaoshi Qian

03-4 11:20–11:40

Phase-field Simulation of Electrocaloric Effects at Ferroelectric Nanowire

Di Liu, Houbing Huang
Advanced Research Institute of Multidisciplinary Science
Beijing Institute of Technology, Beijing, China

- Ferroelectric nanowires show unique phenomena.
- The nanowires have larger polarization, entropy and temperature changes based on the free-standing mechanical boundary conditions.
- The present study contributes to the understanding of size effects of electrocaloric effects.



Polarization distribution at different size of ferroelectric nanowire

Notes

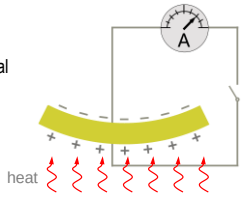
03-5 11:40–12:00

A Novel Thermal-electrical Transition Based On Flexoelectric Effect

Pan Chen, Baojin Chu
Department of Materials Science and Engineering, USTC, China

- The typical thermal-electrical transitions
- Flexoelectric effect related thermal-electrical transition
- Experimental tests and estimation
- The features and the possible applications

Thanks for the support from National Natural Science Foundation of China (Grants No. 51672261 and No. 51373161), 1000 Young Talents Program.



The schematic of the flexoelectric thermal-electrical transition

Notes

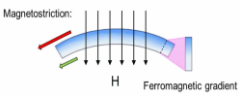
03-6 12:00–12:20

Magnetoelectric Response in Reduced $BiFeO_3$–based Ceramics

Qi Pan, Baojin Chu
Department of Materials Science and Engineering, USTC, China

- Magnetoelectric response through the coupling between flexoelectricity and ferromagnetism.
- The remnant magnetization of the BFO-BTO ceramics is enhanced.
- The apparent flexoelectric response is improved.

Thanks for the support from National Natural Science Foundation of China (Grants No. 51672261 and No. 51373161), 1000 Young Talents Program.



A schematic of the magnetic field induced bending of the reduced BFO-BTO ceramic.

Notes

Technical Special Session 04
FabSurfWAR (ss)

Room 4

10:20–12:20 Wednesday, 15 August

Organizer: Wilhelm Pfleging

Co-Chair: Santiago M Olaizola

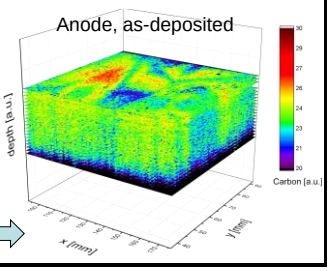
04-1 10:20–10:37

Laser Processing in Battery Manufacturing – Design Concepts, Materials and Analytics

W. Pfleging[1,2], Y. Zheng[1], M. Mangang[1], J. Rakebrandt[1], P. Smyrek[1,2], and H.J. Seifert[1]

[1] IAM-AWP, Karlsruhe Institute of Technology, Karlsruhe, Germany
[2] Karlsruhe Nano Micro Facility, Karlsruhe (KNMF), Germany

- Advanced material concepts (anode, cathode) for increasing specific capacity
- Thick film electrode concept for high gravimetric energy density on cell level
- 3D battery concept for high rate capability
- New approach for rapid elemental mapping of entire composite electrodes



Notes

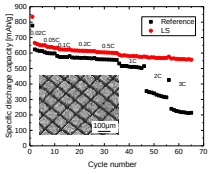
04-2 10:37–10:54

Development of Laser Structured Silicon-based Anodes for Lithium-ion Batteries

Yijing Zheng[1], Peter Smyrek[1,2], Hans Jürgen Seifert[1], and Wilhelm Pfleging[1,2]

[1]Karlsruhe Institute of Technology (KIT), Germany
[2]Karlsruhe Nano Micro Facility (KNMF)

- Development of thick silicon/graphite anode material
- Generation of 3D architecture by applying ultrafast laser processing
  - Significantly improved electrochemical properties at high C-rate
  - Lower cell impedance in fully lithiated state and suppression of impedance increasing due to electrode degradation during the cycling



Notes

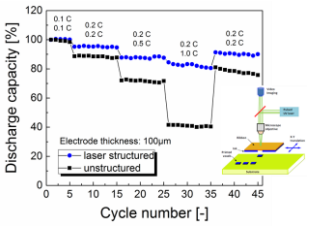
04-3 10:54–11:11

Three-dimensional electrode architectures in laser-printed micro-batteries

P. Smyrek[1,2], H. Kim[3], Y. Zheng[1], A. Piqué[3], H. J. Seifert[1], and W. Pfleging[1,2]

[1] IAM-AWP, Karlsruhe Institute of Technology, Karlsruhe, Germany
[2] Karlsruhe Nano Micro Facility, Karlsruhe (KNMF), Germany
[3] Naval Research Laboratory, Washington DC, U.S.A

- Successful combination of laser-printing / laser-structuring
- Improved cycling behavior for laser-structured NMC thick film electrodes
- Increased battery lifetime
- High rate capability



Notes

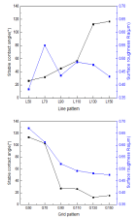
Technical Special Session 04
FabSurfWAR (ss)
Room 4
10:20–12:20 Wednesday, 15 August
Organizer: Wilhelm Pfleging
Co-Chair: Santiago M Olaizola

04-4 11:11–11:28

Investigation of Wettability of zirconia by Nanosecond Laser Treatment

X.B. Jing, C.J. Yang, S.X. Zheng*, X.X. Chen, Y.C. Zhao
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education
Tianjin university, Tianjin, China

- Laser treatment of zirconia has been carried out for investigating the surface wettability .
- Morphological, surface roughness, chemical composition, and contact angles are examined for investigating the effect of laser on the wettability.
- Result showed that the change of surface wettability with time is due to the change of surface chemical composition, especially the change of carbon content and oxygen content. Surface roughness is a factor affecting the stable contact angle.



Variation of Wettability and Ra with laser parameter

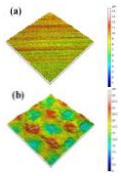
Notes

04-5 11:28–11:45

Effects of Carbon Ion Implantation on Surface Performance of Modified NiTi Shape Memory Alloy

Yuechao Zhao
Key Laboratory of Mechanism Theory & Equipment Design of ministry of education, Tianjin University,China

- Carbon ion implantation was performed on the surface of modified nitinol alloy (NiTi) wafers.
- NiTi wafers are modified by nanosecond laser followed with or without fluoroalkylsilane (FAS) modification process.
- The surface performance and chemical compositions are assessed by SEM, goniometer and EDS .



3D images of (a): pristine wafer and (b): laser ablated wafet

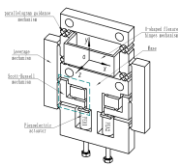
Notes

04-6 11:45–12:02

Design of a Novel Piezoelectric Actuated Two-degree-of-freedom Compliant Stage

Xiubing jing*, Fujun Wang
School of Mechanical Engineering, Tianjin University, China
Sishuo Huang, Peng Shang
School of Mechanical Engineering, Hebei University of Technology, China

- A novel piezoelectric actuated 2-DOF compliant stage is proposed.
- A novel U-shaped flexure hinge is adopted.
- The analytical model is established by considering all the connecting linkages as flexible components.
- The amplification ratio and the natural frequencies of the stage is estimated by FEA.



Schematic of the designed 2-DOF stage

Notes

Technical Special Session 04
FabSurfWAR (ss)
Room 4
10:20–12:20 Wednesday, 15 August
Organizer: Wilhelm Pfleging
Co-Chair: Santiago M Olaizola

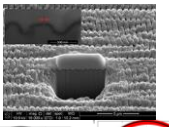
04-7 12:02–12:20

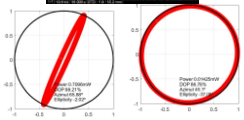
Influence of thin films in optical properties of LIPSS

A. San Blas[1,2], N. Casquero[1,2], S. Sánchez[1,2], A. Rodríguez[1,2] and S.M. Olaizola[1,2]

1- Ceit, Manuel Lardizabal 15, 20018 Donostia / San Sebastián, Spain
2- Universidad de Navarra, Tecnun, Manuel Lardizabal 13, 20018 Donostia / San Sebastián, Spain

- LIPSS with thin-film coatings of SiO_2 or Si_3N_4
  - Thickness between 50 and 300 nm
  - Conformal geometry
- Significant change in reflected polarization
  - No change for polished steel
  - From linear to elliptical in our samples
- Promising for tailoring of LIPSS properties





Notes

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Technical Special Session 05
Micro/nano Structure Measurement Applied in Environmental Science (ss)

Room 5

10:20–12:20 Wednesday, 15 August

Organizer: Li Guan

Co-Organizer: Gaofeng Deng

05-1 10:20–10:40

Pyroelectric and Piezoelectric Effects of Nanomaterials Applied in Air Filtration

Li Guan
Department of Chemistry, Renmin University of China

- Charges are regenerated sensitively by using a subtle temperature variation or slight vibration.
- The regenerated charges could attract more ultra-fine nanoparticles in air.
- Reusable filters with ultra-high efficiency are successfully fabricated by common melting-spray techniques.
- Reusable and transparent window screen with ultra-high efficiency are fabricated using spinning techniques.

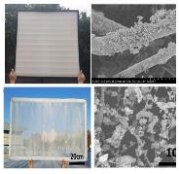


Fig.1. Reusabel filters and window screen and their effects on particles filtration.

Notes

05-2 10:40–11:00

Provincial Standard of Beijing: Technical Specification for Residential Outdoor Air System

Gaofeng Deng
Research Center of Low-Carbon Building, China Academy of Building Research

- This document specifies requirements for $PM_{2.5}$ removal efficiency, system design, wall holing, acceptance test and maintenance of outdoor air system, and spaces reserved in new buildings.

Notes

05-3 11:00–11:20

Indoor Air Quality Control Solution for Commercial Building

David Tay
MayAir Technology (China) Co., Ltd

- Nowadays, the hazard of PM2.5 is familiar to most people in China, but less people realizes that the gaseous pollutants will also cause great harm to human health. People should be aware enough of the fact about the harmfulness of gaseous pollutants. We appreciate this opportunity to introduce our total control solution for both particular matter and gaseous pollutants.

Notes

Technical Special Session 05
Micro/nano Structure Measurement Applied in Environmental Science (ss)

Room 5

10:20–12:20 Wednesday, 15 August

Organizer: Gaofeng Deng

Co-Organizer: Li Guan

05-4 11:20–11:40

Difficulties in the Research and Development of Heat Recovery Ventilator Products

Guangneng Wang
Taizhou Dpurat environmental Equipment Technology Co., Ltd

- Summary of Dpurat / Necessity experiment of bedroom fresh air / Introduction to the research and development of thin unit / Research and development of heat exchange core for bottom overhaul type unit.

Notes

05-5 11:40–12:00

Acceptance of Green Building and Indoor Environment Quality in Shanghai

Xiaoqing Bai
Shanghai Tongji Testing Technology Co.,Ltd

- Green building performance evaluation is one of key to acceptance of Green building and indoor environment quality in Shanghai.
- Indoor environment quality includes indoor auditory environment, indoor optical environment and view, indoor thermal and humid environment and indoor air quality.

Fig.1. Testing for indoor environment.

Notes

05-6 12:00–12:20

The Research and Application of Environmental Purification Material in Special Space Air Quality Standard

Xiaobing Tian
Qingdao Rongchuang Institute of Novel Material Co.Ltd.

- Ceramic materials with stable physi-chemical properties and high catalytic activities can be widely used in the field of air purification.
- Synthetic method,catalytic activity and application of ceramic purification materials in air purification.
- Ceramic purification material has excellent decomposition performance of pollutiongas and ideal adsorption effect.
- Research and development and application prospect of ceramic purification materials in special space air quality purification.

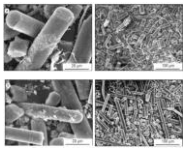


Figure 1 Scanning electron microscope photos: (a) Ceramic material prepared by removing isopentric acid; (b)Ceramic material prepared by removing hydrogen sulfide.

Notes

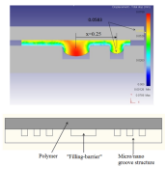
Technical Session 06
Nanomaterials and Nanofluidics
Room 6
10:20–12:20 Wednesday, 15 August
Chair: Fei Wang
Co-Chair: Xinye Zhang

06-1 10:20–10:40

Controllable Micro/nano-fluidic Channel bonding process Based on The Expansion Centerline and "Filling-Barrier" Structure

Jian Jin, Si Di, Yu Hua, Jiadong Qi
1 Shenzhen Institutes of Advanced Technology, Shenzhen, China
2 Guangzhou Institute of Advanced Technology, CAS, Guangzhou, China

- During bonding process, the flowing polymer can easily lead to the channel blockage
- In this paper, the hypothesis of the expansion centerline is put forward by the finite element simulation
- According to the hypothesis, a 'filling-barrier' structure is designed to reduce the displacement produced by the pressure in the bonding process
- By the 'filling-barrier' structure we can control the micro/nano- fluidic channel sealing process



"Filling-Barrier" structure for controlling micro/nano- fluidic channel sealing process

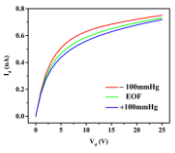
Notes

06-2 10:40–11:00

Pressure Modulation of Ion Conductance and Selectivity in Nano-channels with Weakly Overlapping Electrical Double Layers

Xingye Zhang, Xin Zhu, Zhen Cao, Yang Liu*
College of ISEE, Zhejiang University,China

- A numerical study on the *I-V* responses of nanofluidic channels under external pressure difference.
- Poisson-Nernst-Planck-Stokes simulations demonstrate the interplay between convective flow and concentration polarization.
- The conductance and selectivity are influenced by ion depletion zone inside the channel.
- These results may guide practical designs of pressure-modulated devices.



The I-V characteristics of a nanochannel under pressure

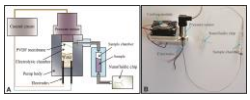
Notes

06-3 11:00–11:20

A High Pressure Nanofluidic Micro-Pump Based on H_2O Electrolysis

Fupeng Liang,Yi Qiao,Mengqin Duan,Na Lu,Jing Tu, Zuhong Lu*
The State Key Laboratory for Bioelectronics, Southeast University, China

- We developed a novel nanofluidic micro-pump based on the principle of electrolysis with high output pressure over 200 ATM, which successfully drove the nanofluid through the 20 nm nanochannels with fast response, high precision and stability. It has small size, operates friendly, and could be applied in many portable nanofluidic application systems, or in other fluid control systems, such as high-performance liquid chromatography.



The high pressure nanofluidic micro-pump based on water electrolysis. (A) the schematic structure and (B)the real picture.

Notes

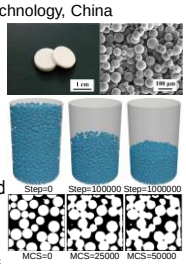
Technical Session 06
Nanomaterials and Nanofluidics
Room 6
10:20–12:20 Wednesday, 15 August
Chair: Fei Wang
Co-Chair: Xinye Zhang

06-4 11:20–11:40

Research on Effect of Particle Size and Sintering Parameters on Porous Transducer

Ruoyu Guo
School of Automation, Beijing Institute of Technology, China

- Potts Kinetic Monte Carlo method and Discrete Element method are combined to analyze the sintered porous transducer.
- Relative density and permeability are utilized to analyze effects of particle size and sintering parameters on the sintering process.
- Glass microspheres with large mean particle size and narrow PSD width are favored during the porous transducer fabrication process.
- Temperature slightly above glasses softening point is suggested during sintering process to control sintering process.



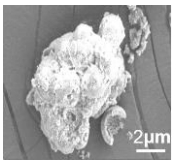
Notes

06-5 11:40–12:00

Synthesis of Hollow Nano-Structured Cobalt Metal-Organic Framework for Supercapacitor Electrodes

Wenlu Xuan, Rajendran Ramachandran, Changhui Zhao, Fei Wang
Department of Electrical and Electronic Engineering,
Southern University of Science and Technology, China

- Cobalt metal-organic framework (Co-MOF) was synthesized at 150 ˚C using hydrothermal method
- Co-MOF with hollow nano-structure is mesoporous material
- Co-MOF displays excellent performance as electrode material with a maximum specific capacitance of 952.5 F g^{-1}
- Co-MOF electrode shows good electrochemical performance due to the large BET surface area



SEM images of Co-MOF

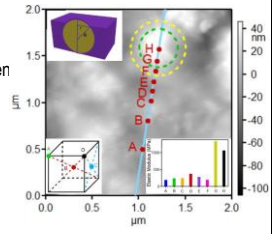
Notes

06 -6 12:00–12:20

Study on Elastic Modulus Enhancement in Particle Filled Polyethylene

Yangjiang Wu[1,3], Dongyan Wu[1], Xiao Liu[1], Zhengzhong Zhang[1], Hao Liu[1], Xiaorong Cheng[1], Xiaohui Li[2] and Zhijun Hu[3]
1 Suzhou Institute of Industrial Technology(SIIT), China
2 Suzhou Academy, Xi'an Jiaotong University, China
3 Center for Soft Condensed Matter, Soochow University, China

- $Al(OH)_3$ inorganic fillers in low density polyethylene matrix
- Relationship between filler particle conten and elastic modulus
- Distance-dependent elastic modulus in particle dispersed thin film
- Fraction estimation of filler particle with body-centred cubic packing type



Notes

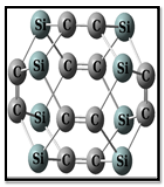
Technical Session 06
Nanomaterials and Nanofluidics
Room 6
10:20–12:20 Wednesday, 15 August
Chair: Xinye Zhang
Co-Chair: Jin Jian

06 -7 Poster 1

Structure, Topology, Vibrational Frequency, Frontier Molecular Orbital Gaps, Stability, Charge, NICS, and Conductivity of Non-segregated Silicon Heterofullerenes: A DFT Approach

Somayeh Soleimani-Amiri[a]* and Maryam Koohi[b]
[a] Department of Chemistry, Karaj branch, Islamic Azad University
[b] Young Research and Elites Club, Islamic Azad University

- The geometry, stability and electronic properties of $C_{20-n}Si_n$ heterofullerenes are compared and contrasted at DFT.
- There are eight isolated-pentagon fullerenic cage.
- Their thermodynamically, kinetically and chemically stability of heterofullerenes are considered.



$C_{20-n}Si_n$ (n = 1, 2, 3, 4, 5, 6, 7, 8)

Notes

Technical Special Session 07
Nanomaterial and Nanotechnology for Biological Applications (ss)

Room 1

13:30–15:30 Wednesday, 15 August

Organizer: Zaixing Jiang

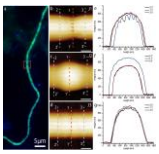
Co-Chair: Dawei Zhang

07-1 13:30–13:50

vitro single-cell dissection using FastScan AFM

Zaixing Jiang
School of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin, China

- Different types of bacterial cell-cell junctions were identified)
- ridges in the OM are found to envelop the individual strings at cell-cell junctions, and they are proposed to strengthen the cell-cell junctions
- we propose a model for the division and growth of the cable bacteria, which illustrate the possible structural requirements for the formation of centimeter length filaments in the recently discovered cable bacteria.



Overview of bacterial cable and different junctions between two bacteria cells.

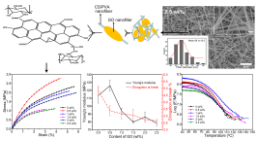
Notes

07-2 13:50–14:10

Chitosan/polyvinyl alcohol/graphene oxide nanofiber and bacteriostasis

Dawei Zhang, Shuai Yang, Yongxu Liu
College of Materials Science and Technology, Northeast Foerestry University, China

- Chitosan/poly(vinyl alcohol)/graphene oxide composite nanofiber membranes
- Antibacterial activity of composite nanofiber membranes
- Composite nanofiber membranes with ciprofloxacin antibiotic drug for wound dressing application



Preparation and mechanical property of chitosan/poly(vinyl alcohol)/graphene oxide composite nanofiber membranes

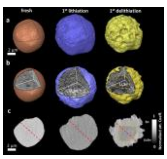
Notes

07-3 14:10–14:30

In Operando X-ray Nanotomography of Energy Materials and Devices

Jiajun Wang
Dept. Electrochemical Engineering, Harbin Institute of Technology, CHINA

- A brief introduction to full-field transmission x-ray microscopy and synchrotron X-ray nanotomography
- In operando X-ray nanotomography was developed successfully to probe battery materials electrochemistry.
- Multiple-dimensional (3D/4D/5D) X-ray imaging technique for a variety applications in energy materials and devices.
- Challenges and opportunities for X-ray nanotomography



Tracking 3D microstructure evolution of battery material particles with In operando X-ray nanotomography

Notes

Technical Special Session 07
Nanomaterial and Nanotechnology for Biological Applications (ss)

Room 1

13:30–15:30 Wednesday, 15 August

Organizer: Zaixing Jiang

Co-Chair: Dawei Zhang

07-4 14:30–14:50

Peptide based Nanomaterial and the Biomedical Application

Lei Liu
liul@ujs.edu.cn
Institute for Advanced Materials, Jiangsu University, Zhenjiang, 212013, China.

- Peptide-organic co-assembly inhibiting amyloid aggregation and the cytotoxicity
- Peptide nanomaterials with the antimicrobial activity
- Bio-interface constructed by specific peptide assembly realize the specific cell behavior modulation and the selective cell isolation

Notes

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07 -5 14:50–15:10

Structure of Biomolecules adsorbed on Graphitic Interface

Qiang Li
School of Chemistry and Chemical Engineering, Shandong University, China

- The early amyloid beta peptide aggregates forming the molecular monolayer at graphite interface are investigated
- Graphene oxide is utilized as the modulator to tune the formation and development of amyloid fibrils
- The structural and morphological organization of RNA hairpin on graphene in water are studied

Notes

Technical Special Session 08
Laser based Submicro and Nanoprocessing (ss)

Room 2

13:30–15:30 Wednesday, 15 August

Organizer: Santiago M Olaizola

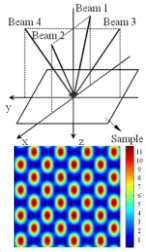
Co-Chair: Mark Hopkinson

08-1 13:30–13:50

NANOSECOND PULSED LASER ENHANCED AEROSOL ASSISTED CHEMICAL VAPOR DEPOSITION

Sergio Sánchez Martín
Electronic Department, Navarra University, Spain

- Introduction of Aerosol Assisted Chemical Vapor Deposition.
- Different methods of nanosecond pulsed laser interference.
- Absorption of a pulsed laser by a growth surface.
- Implementation of Aerosol Assisted Chemical Vapor Deposition in a laser system. State-of-the-art and benefits.



Notes

08-2 13:50–14:10

High-efficiency Volume-Phase Grating simulation and Femtosecond Laser fabrication

Julen J. Azkona
CEIT, Universidad de Navarra, Tecnun, Spain

- A simulation modeled study on Volume-Phase Gratings (VPGs) diffraction properties are presented for a wide range of parameters.
- High efficiency VPGs were fabricated based on the properties presented in the simulation results.
- Laser induced refractive index modification of a promising quantum dot doped glass was estimated for a novel set of processing conditions.

Laser fabricated Volume-Phase Grating as a dispersive element

Notes

08-3 14:10–14:30

Laser Interference Modulated MBE Growth of Site-controlled Quantum Dots

Changsi Peng[1,2,*], Z. Shi[2]
[1]University of Bedfordshire, UK; [2]Soochow University, China
*changsi.peng@beds.ac.uk; changsipeng@suda.edu.cn

- We have demonstrated a new approaching to grow defect-free site-controlled quantum dots (QDs) by MBE.
- A unique novel MBE system was designed and installed and combined a III-V epitaxial growth with in-situ laser interference nano-patterning (ISLINP).
- Indium atoms were selectively desorbed away from the GaAs substrate at points of high light intensity in ISLINP, to selectively nucleate highly controllable periodic formation of two dimensional defect-free QDs arrays.

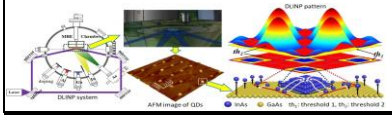


Fig. 1 ISLINP modulated MBE growth of site-controlled QDs.

Notes

Technical Special Session 08
Laser based Submicro and Nanoprocessing (ss)

Room 2

13:30–15:30 Wednesday, 15 August

Organizer: Santiago M Olaizola

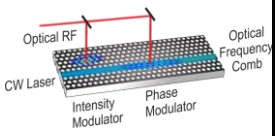
Co-Chair: Mark Hopkinson

08-4 14:30–14:50

Modulating Photonic Crystal Structures to Generate Optical Frequency Combs

Henry Francis
Electronic and Electrical Engineering, University of Sheffield, United Kingdom

- This paper realises the generation of an OFC using nanophotonic structures
- By introducing nanoscale OFC integration, advances can be made in microwave photonics, radar systems and optical communications
- The device is based on all-optical photonic crystal based intensity and phase modulators



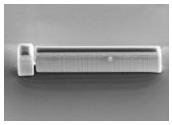
Notes

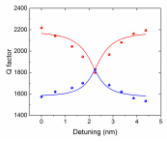
08-5 14:50–15:10

Quality Factor Control in Laterally-Coupled Vertical Cavities

Si Chen
Electronic and Electrical Engineering, University of Sheffield, UK

- Lateral coupled vertical cavities are being fabricated and measured
- A 20% of Q-factor change has been achieved by thermo-optic tuning of cavities
- This approach paves the way towards a few quantum optical applications using vertical cavities
- This work opens up possibilities towards the dynamic control of radiative processes on chip





Notes

Technical Special Session 09
Nano Fabrication and Manipulation of Flexible Electronics (ss)

Room 3

13:30–15:30 Wednesday, 15 August

Organizer: Jianming Zhang

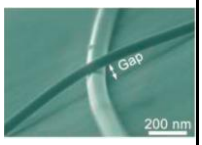
Co-Chair: Yuan Zheng

09-1 13:30–13:50

Capillary-force-induced Cold Welding in Silver Nanowires

Jianming Zhang, Chuanfei Guo
Academy for Advanced Interdisciplinary Studies,
Southern University of Science and Technology

- Capillary force is effective for the cold welding of metallic nanostructures;
- Remarkable increase in electrical conductance and mechanical stretchability;
- Negligible change in optical transmittance;
- Effective to recover damaged metal nanowire networks
- Simple and convenient pathway for making high performance stretchable transparent electrodes



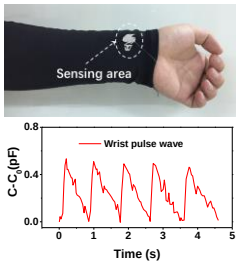
Notes

09-2 13:50–14:10

Multifunctional Cloth Integrated with Sensing Unit

Junlong Yang
Department of Materials Science & Engineering, Southern University of Science & Technology, China

- A versatile approach to fabricate the multifunctional cloth enables the sensing elements to be localized into desired area of traditional cloth.
- The sensing unit provides a high sensitivity of 4.46 kPa^{-1} and mechanical stability under harsh deformations (10000 cycles).
- The multifunctional cloth has been demonstrated to recognize various human motions and the biomechanical signals.



Radial arterial pulse waveform detected from an arm sleeve integrated with sensing unit.

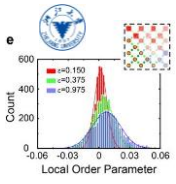
Notes

09-3 14:10–14:30

The Study on Electronic Nano Structures of High-Tc Superconducting Cuprates using STM/STS

Yuan Zheng
Physics Department, Zhe Jiang University, China

- Introduction of scanning tunneling microscopy and scanning tunneling spectroscopy
- Quasi-particle interference and Fourier-transformed STS
- Lattice distortion correction and atomic scale orders.
- Summary
- The paper helps discover the nematic orders in Bi2201, which may be an universal phenomenon in cuprates family.



Histograms of the local nematic order parameters

Notes

Technical Special Session 09
Nano Fabrication and Manipulation of Flexible Electronics (ss)

Room 3

13:30–15:30 Wednesday, 15 August Organizer:

Organizer: Jianming Zhang

Co-Chair: Yuan Zheng

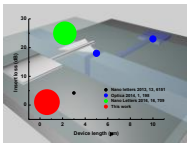
09-4 14:30–14:50

The Memristor on Silicon Waveguide with Switchable Plasmonic Response

Ye Tian

School of information and electronics engineering
Hunan City University, China

- A plasmonic memristor at telecommunication wavelength is designed with compact size (0.61 μm), and high extinction efficiency (4.6 dB/μm).
- Tapered top electrode provide effective vertical coupling of light energy from the Si waveguide to the plasmonic region and at the same time the concentration of the plasmon.
- The break of the trade-off between the low loss and high extinction ratio.



Notes

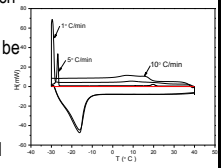
09-5 14:50–15:10

Fabrication and Application of Low melting point Ga-In-Sn liquid metal in Flexible Electronics

Liuting Li#, Chuanfei Guo†

Department of Materials Science and Engineering, Southern University of Science and Technology, Shenzhen, 518055, China

- Eutectic point can approach -10°C ~ -15°C, is much lower than Galinstan (E- GaIn, ~ 15.5°C)
- Free fatigue, conductive and surface tension can be controlled by voltage
- Design microelectronic circuit and fabricate microchannel or highly sensitive sensor
- Their applications range from soft electronics and robotics to energy device



DSC testing for Ga-In-Sn at different rate

Notes

Technical Special Session 10
Micro/Nano Robotics for Single Cancer Cells (MNR4SCell) (ss)

Room 4

13:30–15:30 Wednesday, 15 August

Organizer: Zuobin Wang

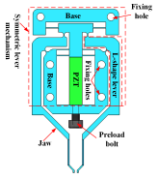
Co-Chair: Fujun Wang

10-1 13:30–13:50

Design and Characteristics of a Novel Compliant Symmetric Micrograpper Mechanism

Beichao Shi, Fujun Wang, Zhichen Huo, Yanling Tian, Xingyu Zhao, Dawei Zhang
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, China

- A novel compliant symmetric micrograpper mechanism is developed for the manipulation of different kind of microscale objects.
- Pseudo-rigid-body modeling method and matrix-based compliance modeling method are used to establish the analytical model.
- According to the theoretical calculation and finite element analysis results, the developed micro-gripper has the following characteristics: the amplification ratio 8.26, the input stiffness 2.19 N/μm and the natural frequency 1446.1 Hz.



Schematic diagram of the micrograpper

Notes

10-2 13:50–14:10

A novel Archimedes Planar Springs Flexure Structure for Microforce Actuator

Chongkai Zhou, Yanling Tian, Fujun Wang, Mingxuan Yang, Dawei Zhang
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, China

- A novel Archimedes planar spring (APS) with lower stiffness and compact structure is designed;
- The theoretical analysis of the APS stiffness is carried out using the Castigliano's theory and linear elasticity theory of material mechanics. To optimize the structure, the Finite Element Analysis (FEA) is utilized.;
- The microforce is generated by an electromagnetic system, which has good resolutions and can be operated easily and accurately.

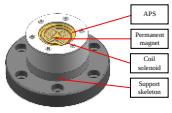


Fig. 1 Schematic diagram of the electromagnetic force actuator

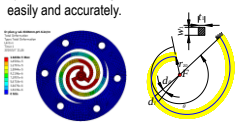


Fig. 2 Theoretical and simulated model of the suspension mechanism

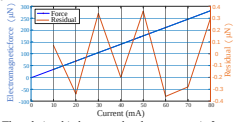


Fig. 3 The relationship between the electromagnetic force and the input current

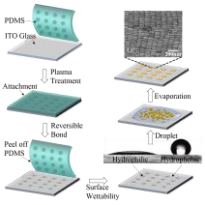
Notes

10-3 14:10–14:30

Precisely Lateral Alignment of Gold Nanorods Array via Hydrophilic-Hydrophobic Pattern

Shuang Wang, Chang Liu, Yanyan Wang*
State Key Laboratory of Precision Measuring Technology & Instruments, Tianjin University, China

- Orderly arranged GNRs self-assembly array via hydrophilic-hydrophobic substrate.
- Micro circular and linear arrays were achieved by tuning the topographical structures on the PDMS molds.
- The optimal concentration and relative humidity were found to form lateral aligned GNRs array.
- The strategy achieved near 100% yield and was potentially applicable for assembling other nanomaterials.



Schematic of the Self-Assembly GNRs Micro Array

Notes

Technical Special Session 10
Micro/Nano Robotics for Single Cancer Cells (MNR4SCell) (ss)

Room 4

13:30–15:30 Wednesday, 15 August

Organizer: Zuobin Wang

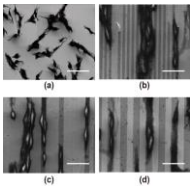
Co-Chair: Fujun Wang

10-4 14:30–14:50

Effects of Micro-structures on Growth Behaviors of Neurons

Xueying Yang
International Research Centre for Nano Handling and Manufacturing of China, Changchun University of Science and Technology, China

- The electron beam lithography was combined with the lift-off technology to fabricate micro-structures
- The width of the wire grid strutures was 5 μm, 10 μm and 15 μm
- The neurons cultured on the structures grew orderly along the direction of the wire grid.
- The micro-structures with the10 μm width made a direct impact on the shape of neurons



SEM images of neurons cultured on the micro-structures with different widths

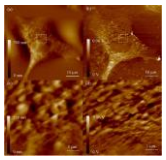
Notes

10-5 14:50–15:10

Determination of Optimal Curing Conditions for Imaging Single Lung Cancer Cells by Atomic Force Acoustic Microscope

Xuan Wang
International Research Centre for Nano Handling and Manufacturing of China, Changchun University of Science and Technology, China

- Discussing the effects of different curing agents on A549 cells.
- Discussing the effects of different curing times on A549 cells.
- Discussing the effects of different curing concentrations on A549 cells.
- Presenting a method for the determination of optimal curing conditions by AFAM.



2% concentration of paraformaldehyde for 60 min

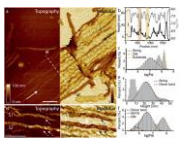
Notes

10-6 15:10–15:30

In Vitro Single-cell Investigating by SPM

Prof. Mingdong Dong
Interdisciplinary Nanoscience Center (iNANO)
Aarhus University, DK-8000, Aarhus C,Denmark

Scanning probe microscope provided unprecedented visualization of individual molecule, and also allow to manipulate objectives at nanoscale. This talk will review the recent results based on SPM manipulation for investigation of biological samples.



Internal Structures of Dissected cell

Notes

Technical Special Session 11
Nanomaterials for Energy and Environmental Applications (ss)

Room 5

13:30–15:30 Wednesday, 15 August

Organizer: Li Zhang

Co-Chair: Hangsheng Yang

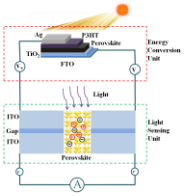
11-1 13:30–13:50

Design and Fabrication of Self-Powered Photodetector with Boardband Response

Wei Tian

School of Physical Science and Technology, Soochow University, China

- All perovskite based photodetector-solar cell integrated system was demonstrated
- Designing CdS/Se heterojunction as high-performance self-powered UV-visible broadband photodetector
- Self-powered UV-visible Schottky junction photodetector based on Se microrod



Photodetector-solar cell Integrated system

Notes

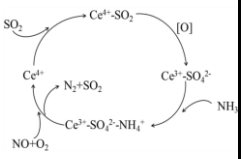
11-2 13:50–14:10

In Situ HRTEM Study of SO_2 induced SCR Catalyst Deactivation and Regeneration

Hangsheng Yang

School of Materials Science & Engineering, Zhejiang University, China

- Reaction between catalyst and SO_2 and NH_3 was studied using in situ HRTEM
- Equilibrium between surface sulfate deposition & decomposition was observed in atomic scale.
- SCR catalyst with high resistance to SO_2 induced deactivation at low temperature was achieved.



Schematic diagram of surface sulfate deposition and decomposition

Notes

11-3 14:10–14:30

Biological metabolism synthesis of nanosized electrode materials from bacteria towards high-performance Lithium-ion batteries

Yang Xia

College of Materials Science & Engineering, Zhejiang University of Technology, Hangzhou, 310014, China

- Biological metabolism offers elaborate biochemical pathways to manipulate the element cycling and material formation.
- Biological metabolism is a two-fold win strategy that converts pollutants into to energy storage nanomaterials.
- Fe_2O_3 and Se nanomaterials are synthesized from bacteria as biofactory for advanced Lithium-ion batteries.
- This work opens a new avenue to solve energy and environmental issues at the same time.

Notes

Technical Special Session 11
Nanomaterials for Energy and Environmental Applications (ss)
Room 5
13:30–15:30 Wednesday, 15 August
Organizer: Li Zhang
Co-Chair: Hangsheng Yang

11-4 14:30–14:50

Nanostructured MoS_2-a Promising Anode Material for Sodium-ion Capacitors

Rutao Wang[1,2], Shijie Wang[2], Li Zhang[2]
[1]School of Materials Science and Engineering, Shandong University, China
[2]Department of Mechanical and Automation Engineering, The Chinese Univeristy of Hong Kong, China

- MoS_2–carbon nanocomposite was fabricated via a facile interface-modification route.
- MoS_2-C nanocomposite shows the typical pseudocapacitive characteristics.
- Sodium-ion capacitor based on MoS_2-C anode exhibits the high energy and power density.
- For the fabrication of SIC, two-electron intercalation reaction outperforms four-electron conversion reaction.

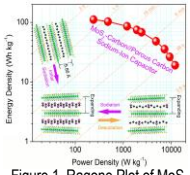


Figure 1. Ragone Plot of MoS_2-C based sodium-ion capacitors and Schematic illustration of the intercalation mechanism of MoS_2-C composite

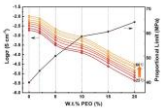
Notes

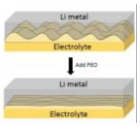
11-5 14:50–15:10

PEO reinforced Li_6PS_5Cl composite solid electrolyte: interfacial evolution

Jun Zhang
College of Materials Science & Engineering, Zhejiang University of Technology, China

- PEO is used to enhance the mechanical property of Li_6PS_5Cl solid electrolyte
- The composite electrolyte enables improved performance of all-solid-state battery
- Ex situ characterizations reveal the evolution of electrolyte/lithium interface
- Moderate content of PEO enables a stable electrolyte/lithium interface





Notes

Technical Session 12
Nanoposition and Nanomanipulation
Room 6
13:30–15:30 Wednesday, 15 August
Chair: Dachang Zhu
Co-Chair: Kang Guo

12-1 13:30–13:50

Identification of Nonlinear Time-delay System Using Multi-dimensional Taylor Network Model

LI Chen-Long, YAN Hong-Sen*
School of Automation, Southeast University, Nanjing, 210096, P. R. China
Key Laboratory of Measurement and Control of Complex Systems of Engineering, Ministry of Education,
Nanjing, 210096, P. R. China

- For the identification of nonlinear time-delay system, combining multi-dimensional Taylor network (MTN) model with improved conjugate gradient (ICG) method, named ICG-MTN, is proposed in this paper.
- MTN has the strong approximative property and the simple structure.
- MTN is regarded as the identification model relying on its characteristic of strong approximation.
- ICG method is regarded as the learning algorithm of MTN.

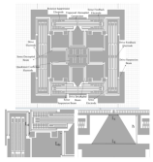
Notes

12-2 13:50–14:10

Rotation Error Suppression for a Doubly Decoupled MEMS Gyroscope

Hengzhi Hu, Xudong Zheng*, Yiyu Lin
Micro-Satellite Research Center, Zhejiang University
Hangzhou 310027, P. R. China

- Three novel methods to suppress rotation error are proposed and elaborated in detail with FEM simulation results in this paper.
- The stiffness of beams are optimized to achieve lower rotation error and approximately mode matching.
- Comparing to the rectangular connection , the trapezoid connection we propose suppresses the rotation error by 71.3%.
- The rotation error can be further suppressed by rotation suppression electrode, the suppression level is 14% at 4V.



Rotation suppression desgin of decoupled gyroscope

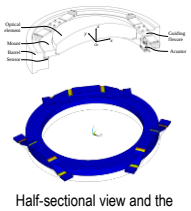
Notes

12-3 14:10–14:30

Design of a Precise Axial Adjusting Mechanism with Three Guiding Flexures for Optical Element

Kang Guo, Defu Zhang
Changchun Institute of Optics, Fine Mechanics and Physics,
Chinese Academy of Science, China

- An axial adjusting mechanism for regulating optical element in ultra-precision optical system is designed utilizing the guiding flexures.
- The guiding flexures are arranged in space so that the mechanism can obtain out of plane movement with high adjustment precision.
- Under the premise of the stress within 150 MPa, the compliance of the mechanism in Z-direction can reach 19.8 μm/N, and the axial/lateral compliance ratio can achieve about 170.



Half-sectional view and the stress distribution map of the axial adjusting mechanism

Notes

Technical Session 12
Nanoposition and Nanomanipulation
Room 6
13:30–15:30 Wednesday, 15 August
Chair: Dachang Zhu
Co-Chair: Kang Guo

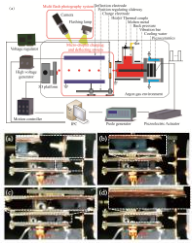
12-4 14:30–14:50

Development of a Metal Micro-droplet Ejecting Equipment for Manipulation Jetting Trajectory

Jieguang Haung; Jun Luo; Kang Zhang; Hao Yi; Lei Zhao; Lehua Qi
School of Mechanical Engineering, Northwestern Polytechnical University, China

- A horizontal ejecting apparatus was developed to spray uniform metal micro-droplets;
- Based on the electrostatic induction theory, the droplet was charged using a charging electric field.
- The electric field force was used to regulate the flight trajectory.

Contribution: an apparatus was developed to physically simulate the uniform meal micro-droplet 3D printing under micro gravity condition.



The schematic of experiment setup and results

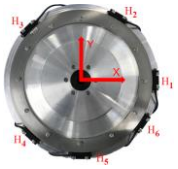
Notes

12-5 14:50–15:10

Radial Error Motion Measurements at Nanometer-level Precision Using Angle Encoder with Different Four-scanning-heads Arrangements

Yang Jiao, Jiasheng Li and Pinkuan Liu
School of Mechanical Engineering, Shanghai Jiaotong University, China

- Validation of optimal-arrangement-based four-scanning-heads method for measuring radial error motion is presented
- Experiments are performed to measure error motion by three different four-heads arrangements
- The three measurement results agree very well and show nanometer-level repeatability
- This technique is suitable for measuring spindle error motion with angle encoder as feedback device



Notes

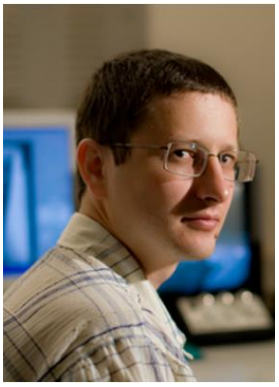
Technical Special Session 13
Functional Materials for Bottom up Nano-assembly (ss)

Room 7

13:30–15:30 Wednesday, 15 August

Organizer: Artemy Irzhak

Co-Chair: Victor Koledov

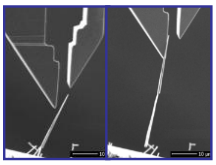


13-1 13:30–13:50

Interaction Forses on Nanoscale: Manipulator-Object-Surface

Zuobin Wang, Zhengxun Song, Lanjiao Liu, Li Li
International Research Centre for Nano Handling & Manufacturing of China
Victor Koledov[1], Peter Lega[1], Svetlana von Gratovsky[1], Dmitry Kuchin[1], Artemy Irzhak[2,3]
[1] IRE RAS, Russia; [2] IMT RAS, Russia; [3] NUST MISiS, Russia

- Experiments on the manipulation of ZnO whiskers have been carried out
- It was calculated value of the force of whisker adhesion to the metal manipulator
- It was identified ways to control the adhesion forces on the nanoscale



Capturing of the whisker by adhesion forses

Notes

13-2 13:50–14:10

Spin-torque Oscillators

Zhongming Zeng, Bin Fang, Giovanni Finocchio, Victor Koledov and Svetlana von Gratowski

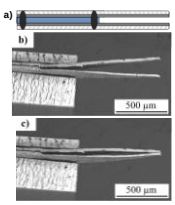
Notes

13-3 14:10–14:30

Microtweezers on the Basis of Two-Way Shape Memory Alloy Ribbon

Alexander Shelyakov, Nikolay Sitnikov
National Research Nuclear University MEPhI , Moscow, Russia
Kirill Borodako, Victor Koledov, Maxim Berezin
Kotelnikov IRE RAS, Moscow, Russia

- Layered amorphous-crystalline composite ribbons of $Ti_{50}Ni_{25}Cu_{25}$ alloy with two-way shape memory effect were produced by melt spinning technique
- A series of microtweezers (microgrippers) with the gap adjustable in the range from 5 to 120 μm was fabricated on the base of composite ribbons
- Complete process of manipulating (gripping - holding - moving – releasing) the carbon fibers at the diameter 10 to 20 μm with using the developed microtweezers was demonstrated



Sketch (a) and SEM-images of microtweezers in the open (b) and closed (c) state

Notes

Technical Special Session 13
Functional Materials for Bottom up Nano-assembly (ss)

Room 7

13:30–15:30 Wednesday, 15 August

Organizer: Artemy Irzhak

Co-Chair: Victor Koledov

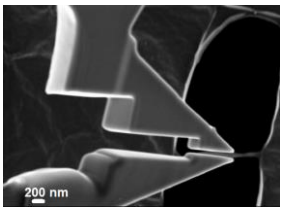
13-4 14:30–14:50

Assembling nanostructures from DNA using a composite nanotweezers with a shape memory effect

[1,3]Andrey Orlov, [1]Anatoly Smolovich, [2]Nikolay Barinov, [1]Aleksei Frolov, [1]**Peter Lega**, [2]Dmitry Klinov, and [1]Victor Koledov

[1]Kotelnikov Institute of Radioengineering and Electronics of RAS, Russia
[2]Federal Research and Clinical Center of Physical-Chemical Medicine, Russia
[3]Institute of Nanotechnology of Microelectronics of RAS, Russia.

- The nanotweezers made from material with a shape memory effect was developed by the authors.
- Advanced technique for fixing DNA molecules on a membrane with microcuts were demonstrated.
- A nanostructure with a metalized (conducting) DNA molecule (bundles of several chains) was assembled by composite nanotweezers and prepared for studying of its electrotransport properties.



Capturing DNA bunch by composite nanotweezers

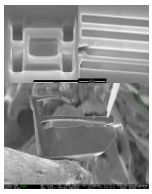
Notes

13-5 14:50–15:10

Superconductivity and Related Quantum Effects in Nano Structures Created through Bottom-Up Nano-integration

Somnath Bhattacharyya
School of Physics University of the Witwatersrand, Johannesburg, South Africa

- fabrication of quantum rings from individual nano-diamond using shape memory alloy composite nano-tweezers.
- Quantum transport of such nano-necklaces will be probed in order to study the quantum effects in such structures.
- This bottom-up nano-integration technique demonstrates a fabrication route for complex nanostructured quantum rings



Notes

Technical Special Session 14
Surface Analysis and Application of Functional Nanomaterials (ss)

Room 1

15:50–17:50 Wednesday, 15 August

Organizer: Qiang Li

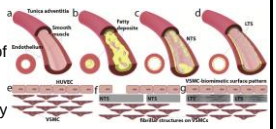
Co-Organizer: Dan Xia

14-1 15:50–16:10

Fabrication of Bionic Surface and it's Application

Dan Xia
xiad@hebut.edu.cn
College of Materials Science and Engineering, Hebei University of Technology, Tianjin, 300130, China

- The bionic surface patterns matched the morphology of the VSMCs well
- The biomimic surface promotes the adhesion, proliferation, and migration of HUVECs
- The patterned surfaces can significantly enhance re-endothelialization



Notes

14-2 16:10–16:30

Self-Assembly of Amyloid Peptides and the Applications

Lei Liu
liul@ujs.edu.cn
Institute for Advanced Materials, Jiangsu University, Zhenjiang, 212013, China.

- High resolution structural imaging for amyloid peptide self assembly and modulation
- Peptide-organic co-assembly inhibiting amyloid aggregation and the cytotoxicity
- Bio-interface constructed by specific peptide assembly realize the specific cell behavior modulation and the selective cell isolation

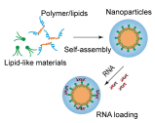
Notes

14-3 16:30–16:50

Development of Nanoparticulate Systems for Gene Therapy and Precise Medicine

Chuanxu Yang
Interdisciplinary Nanoscience Center (iNANO), Aarhus University, Denmark

- A library of lipid-like materials were synthesized for generating of a serial of nanoparticles;
- Optimization and in vitro screening identified highly potent nanoparticle for delivery RNA therapeutics, including siRNA, miRNA, mRNA and CRISPR-Cas9;
- Efficient delivery of siRNA, microRNA and mRNA in mice;
- Knockdown of inflammatory cytokines in arthritic mice as a potential gene therapy.



Notes

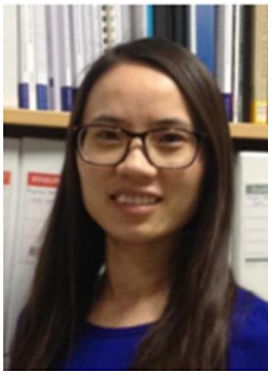
Technical Special Session 14
Surface Analysis and Application of Functional Nanomaterials (ss)

Room 1

15:50–17:50 Wednesday, 15 August

Organizer: Dan Xia

Co-Organizer: Qiang Li



14-4 16:50–17:10

Directing peptide self-assembly with local modifications

Dr Christian Bortolini

Interdisciplinary Nanoscience Center, Aarhus University, Denmark
Department of Chemistry, University of Cambridge, UK

- Aberrant assembly of the amyloid–β (Aβ) is responsible for the development of **Alzheimer's disease**.
- The Aβ fragment, **KLVFF (Aβ16-20)**, is crucial for Aβ assembly and considered an Aβ aggregation inhibitor.
- **Acetylation** of KLVFF turns it into an extremely fast self–assembling molecule, reaching size of **mm in seconds**.
- KLVFF is **metastable**: self–assembly can be directed towards crystalline or fibrillar phases via **chemical modifications**.

Aβ16-20 Amyloid Crystal

Notes

14-5 17:10–17:30

Visualization of the Water Adlayers Confined in Graphene/Mica Interface

Qiang Li
School of Chemistry and Chemical Engineering, Shandong University, China

- The structural of the confined water layer confined between graphene/mica interface was investigated
- The dynamic dewetting/rewetting behaviors of icelike water adlayers was monitored
- The fluid like water adlayers confined between graphene/mica interface was also studied

Notes

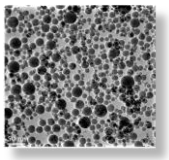
Technical Special Session 15
Nano Stencil (ss)
Room 2
15:50–17:50 Wednesday, 15 August
Organizer: Santiago M Olaizola
Co-Chair: Mark Hopkinson

15-1 15:50–16:10

Titanium oxide based nanoparticles by laser ablation in supercritical carbon dioxide

Erkki Levänen, Amandeep Singh
Laboratory of Materials Science, Tampere University of Technology, Finland

- Pulsed laser ablation in liquid (PLAL) is emerging particle synthesis method.
- We introducing new modification of PLAL based on supercritical CO_2, where CO_2 participates to reaction.
- Method produces Ti_xO_y particles with various compositions and enables also target surface modification.



Ti_xO_y particles

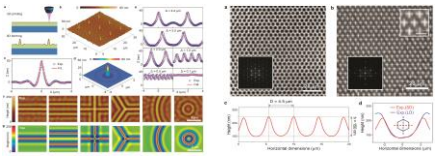
Notes

15-2 16:10–16:30

Complex micro/nanostructures fabricated by laser-induced strain

Qian Liu[1,2]
[1]National Center for nanoscience and technology, China; [2]Nankai University, China, liuq@nanoctr.cn

- Developing a novel micro/nano fabrication method based on laser-induced strain
- Building a basic unit of strain
- Realizing multi-pattern images only by one mask



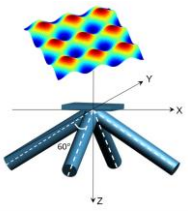
Notes

15-3 16:30–16:50

In-situ laser interference surface patterning of nanomaterials

Mark Hopkinson
Department of Electronic and Electrical Engineering, University of Sheffield

- Multi-beam laser interference for the in-situ patterning of surfaces within various growth reactors
- Project aim is to demonstrate large-scale arrays highly ordered arrays of nanostructures.
- Application to epitaxial growth and surface oxidation processes
- The presentation will summarise recent work on the EU 'Nanostencil' project



NANOSTENCIL

Notes

Technical Special Session 16
Insect Flight and Bionic MAV Wings (ss)
Room 3
15:50–17:50 Wednesday, 15 August
Organizer: Jiyu Sun
Co-Chair: Wei Wu

16-1 15:50–16:05

The Thin Solid Membrane Structure Design of Imitated Dragonfly Wing Adopting Different Transition Structure

Chunxiang Pan[1], Jiyu Sun[2], Zhenpeng Chen[3]
[1] School of Aviation Operations and Services Air Force Aviation University
[2] Key Laboratory of Bionic Engineering (Ministry of Education, China), Jilin University
[3] School of Aviation Operations and Services Air Force Aviation University

- The transition structure of dragonfly wing mainly consists of three basic grid structure, among which is the leading edge of quadrilateral structure.
- Four different transition structure models of dragonfly wing have been designed.
- The performance of pressure bearing of bionic model based on triangle transition structure is better than the ones using quadrilateral and pentagon transition.

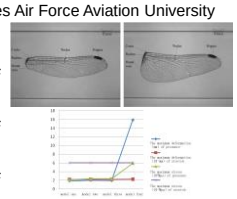


Figure Dragonfly wing and comprehensive performance analysis of the four bionic models

Notes

16-2 16:05–16:20

Nanomechanical and Angle-dependence Optical Properties in Beetle *Popillia Indgigonacea Motsch* (Coleoptera)

Jiyu Sun[1], Wei Wu[1], Na Li[1], Xianping Liu[1], Zhijun Zhang[3]*
[1] Key Laboratory of Bionic Engineering, Jilin University
[2] School of Engineering, University of Warwick, Coventry CV4 7AL, UK
[3] School of Mechanical Science and Engineering, Jilin University
Changchun, P.R. China

- *Popillia indgigonacea Motsch* show iridescence color and change color in different incidence angle.
- The surface of elytron is composed of fish-like scales and rows of pits distributed in order.
- Nanomechanical properties of transverse and longitudinal sections of beetle elytra have relationship with their distribution of protein-chitin fibers and their structural characteristics
- This study help to get insight into biological functionality and inspire the bionic materials designs.

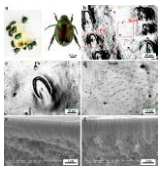


Figure (a) Photographs of *P. i. Motsch*. (b)-(d) CLSM images of elytron surface. SEM images of microstructure of (e) transverse and (f) longitudinal sections of elytra.

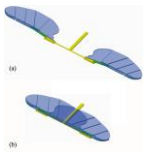
Notes

16-3 16:20–16:35

Design of bionic deployable wings

Jiyu Sun1, Chao Liu1, Wei Wu1, Ruijuan Du1, Zhijun Zhang2*
1 Key Laboratory of Bionic Engineering (Ministry of Education, China), Jilin University
2 School of Mechanical Science and Engineering, Jilin University
Changchun, P.R. China

- Learn from the Asian ladybeetle hindwings, bionic deployable wings are designed
- The deployable motion is achieved by the mechanical structure of two four-bar-linkages.
- The links are hollow structure which can reduce the mass and improve the maneuverability in flight
- The simulation shows that their mechanical properties can have beneficial effect on the flight by FEA.



The unfolding (a) and folding (b) actions of binoc deployable wings.

Notes

Technical Special Session 16
Insect Flight and Bionic MAV Wings (ss)
Room 3
15:50–17:50 Wednesday, 15 August
Organizer: Jiyu Sun
Co-Chair: Wei Wu

16-4 16:35–16:50

Effects of Dragonfly Wing Vein Structure on the Flight Charateristics

Jiyu Sun and Ruijuan Du
Key Laboratory of Bionic Engineering, Jilin University, China
Chao Liu
Key Laboratory of Bionic Engineering, Jilin University, China

- The cross-sectional structure of the veins will be influent to flight characteristics of dragonfly.
- In this paper, elliptical and circular tube structures are found in vein by fluorescence microscope.
- It is shown that model Ⅰ with elliptical cross-sectional structural vein can generate greater lift and produce less resistance.
- It will be provided a bioinspiration to design a bionic flapping MAV.

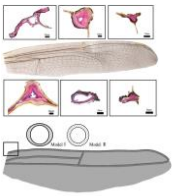


Figure Diversity structure of dragonfly veins and three-dimensional geometric models

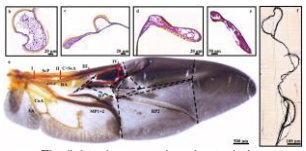
Notes

16-5 16:50–17:05

Analysis of light-mass and high-strength veins of hind wing from Asian ladybird beetle

Jiyu Sun[1], Zelai Song[1], Chunxiang Pan[2], Zhuo Liu[3,*]
[1] Key Laboratory of Bionic Engineering (Ministry of Education, China), Jilin University, P.R. China
[2] Department of Aircraft and Powertrains, Aviation University of Air Force , P.R. China
[3] Department of vascular surgery, China-Japan Union Hospital of Jilin University, P.R. China

- The structure morphologies of hind wing and cross sections of veins
- Mass tests of hind wings and bodies of Asian ladybird beetle (*Harmonia axyridis*)
- Tensile tests of hind wings



The light microscopy imaging technique of wing and cross-sections of C+ScA.

Notes

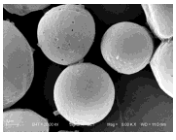
16-6 17:05–17:20

Rheological Properties of Corn Starch Dispersions in Pregelatinized Starch Solution

Yunhai Ma, Siyang Wu, Jin Tong, Xin Zhang and Jie Peng

The Key Laboratory of Bionic Engineering (Ministry of Education, P. R. China), Jilin University, P. R. China

- The rheology properties of corn starch dispersions in pre-gelatinized starch solution were studied.
- The dispersions undergone the shear thinning and shear thickening processes.
- The dispersions exhibited extremely thixotropic behavior at high concentrations.
- Angular frequency had more significant effect on critical oscillatory shear stress.



Scanning electron microscopy images of corn starch particles

Notes

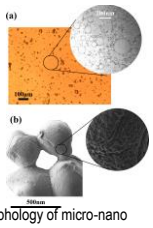
Technical Special Session 16
Insect Flight and Bionic MAV Wings (ss)
Room 3
15:50–17:50 Wednesday, 15 August
Organizer: Jiyu Sun
Co-Chair: Wei Wu

16-7 17:20–17:35

Study on preparation technology of self-healing micro-nano capsule based on calcium alginate

Jiyu Sun[1], Yueming Wang[1], Chunxiang Pan[2], Limei Tian[1]
[1] Key laboratory of bionic engineerging (Ministry of education, China), Jilin university, Changchun, P.R.China
[2] Department of aircraft and powertrains, Aviation university of air force, Changchun, P.R.China

- Micro/nanocapsules embedment was an effective method to repair micro-crack and mechanical damage.
- Preparation technology of self-healing micro-nanocapsule based on calcium alginate was studied by in-situ method.
- Rate of covering and particle size were investigated under different emulsifier dosages and core-wall ratios.



Morphology of micro-nano capsules examined by optical microscopy (a) and scanning electron micrography (b).

Notes

Technical Special Session 17
Nano Optoelectronic Materials and their Applications for Biosensing and Biological Detection (ss)

Room 4

15:50–17:50 Wednesday, 15 August

Organizer: Jinhua Li

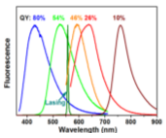
Co-Chair: Hanbin Ma

17-1 15:50–16:10

Luminescent CDots: synthesis and applications

Songnan Qu
Changchun Institute of Optics, Fine Mechanics and Physics, CAS, China

- Controlling the bandgap emissions of CDots through sp2C domains controlling and surface engineering.
- The prepared NIR emissive CDs can act as in vivo fluorescence and thermal theranostics for cancer treatment.
- Based on "supra-CDs" systems, water-jet luminescent printing and effective NIR photothermal conversion up to 54% were achieved.
- Full-color and white light emissive CDot-based LEDs were prepared.



Fluorescent spectra of the prepared CDots.

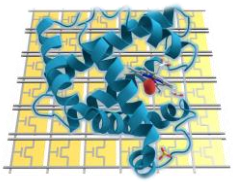
Notes

17-2 16:10–16:30

Active Pixel and its Applications in Biosensing

Hanbin Ma
CAS Key Laboratory of Bio-medical Diagnostics, Suzhou Institute of Biomedical Engineering and Technology, CAS, P.R. China

- Active pixel sensor (APS) is a mainstream technology in digital imaging sensor;
- With the similar architecture, an APS can also be used to detect biological samples;
- Advanced large-area electronics can be used as powerful fundamental elements for next generation low-cost active pixel biosensors.



An illustration of low-cost large-area active pixel biosensors

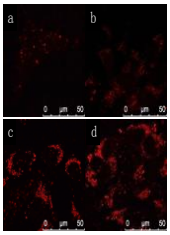
Notes

17-3 16:30–16:50

Interaction of nanomaterials with cells and their biomedical application

Silu Zhang
College of Optoelectronic Engineering, Shen Zhen University, China

- Study of nanoparticles interacting with human cells, revealing their intracellular fate.
- Endocytosis and exocytosis are identified as the major pathways for nanoparticles entering and exiting cells.
- Use optical switch to control drug release in cytosol, circumventing multidrug resistance and reducing toxicity.



Time dependent cellular uptake of NPs

Notes

Technical Special Session 17
Nano Optoelectronic Materials and their Applications for Biosensing and Biological Detection (ss)

Room 4

15:50–17:50 Wednesday, 15 August

Organizer: Jinhua Li

Co-Chair: Hanbin Ma

17-4 16:50–17:10

Optical Properties and Immunoassay Applications of Semiconductor Nanomaterials

Xueying Chu
School of Science, Changchun University of Science and Technology, China

- Biofunctional doped ZnS and TMDCs were used as fluorescent or Raman labels to perform immunoassays;
- High specificity and selectivity of the assays were demonstrated by control experiments;
- The limit of detection (LOD) for the ZnS based fluorescent assay is about 9.6nM;
- The LOD can be declined to 1fM in the Raman immunoassays.

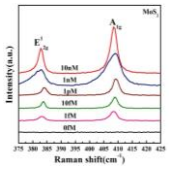


Fig. 1 Raman spectra of the TMDCs based Raman immunoassays.

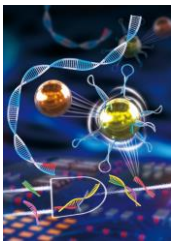
Notes

17-5 17:10–17:30

Gold Nanoparticles-Based DNA Logic Gate for miRNA Inputs Analysis

Prof. Peng Miao
Suzhou Institute of Biomedical Engineering and Technology, Chinese Academy of Sciences, China

- We have fabricated an "AND" DNA logic gate platform for miRNA inputs analysis.
- Target miRNA inputs are able to trigger DNA structural transformations.
- Localized surface plasmon resonance variation of gold nanoparticles is used for signal output.
- Stand displacement reaction and hybridization chain reaction are integrated.



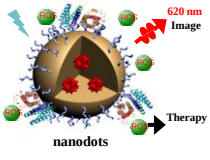
Notes

17-6 17:30–17:50

Nonlinear Optics based Biomaging and Photodynamic Therapy

Bobo Gu
Department of Biomedical Engineering, Shanghai Jiao Tong University, China

- Second-harmonic generation signal excited photodynamic therapy, enhancing therapy efficiency
- Imaging-guided *in vivo* brain-blood-vessel closure using two-photon photodynamic therapy
- Organelle-specific labeling in live cells using resonance Raman probes



Bioimaging and photodynamic therapy based on functional nanodots

Notes

Technical Special Session 18
Manufacturing and Measurement of Micro/Nano-Scale Optical Waveguides (ss)

Room 5

15:50–17:50 Wednesday, 15 August

Organizer: Degui Sun

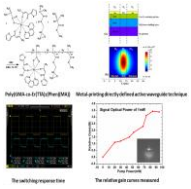
Co-Chair: Changming Chen

18-1 15:50–16:10

Active polymer optical waveguide devices integrated with switching and amplifying functions

Changming Chen*, Jihou Wang, Ru Cheng, Daming Zhang
Key Laboratory of Integrated Optoelectronics, JLU Region, College of Electronic Science and Engineering, Jilin University, China
E-mail: chencm@jlu.edu.cn

- The functional integrated devices with switching and amplifying properties are designed and fabricated by the metal-printing directly defined technique.
- The novel erbium-containing polymer is synthesized as waveguide material.
- The switching response time is measured as 300 μs and the relative optical gain at 1530 nm is obtained as 3 dB, respectively.
- The technique is suitable to achieve large-scale and multi-functional optoelectronic integrated circuit.



Graphic Abstract

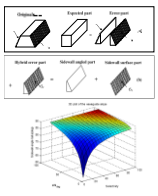
Notes

18-2 16:10–16:30

Waveguide Roughness Measurement Method based on Amplitude and Phase Information of Ttest Light

Degui Sun[a,b]* and Hongpeng Shang[a]
a. The School of Electro-Optical Engineering, Changchun University of Science and Technology, China
b. University of Ottawa, Ottawa, Canada, 25 Templeton Street, Ottawa, ON K1N 6N5, Canada
E-mail: sundg@cust.edu.cn

- The waveguide structure is divided into an ideal part and a deviated part.
- A measurement model is established by using the theory of a given instrument optical system to set up the amplitude of light wave, phase and roughness.
- The accuracy of waveguide surface roughness will reach± 20nm.



Graphic Abstract

Notes

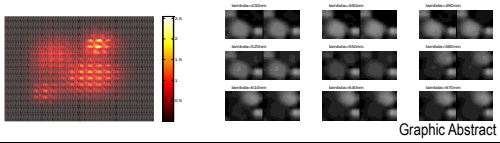
18-3 16:30–16:50

Ultra-High-Sensitivity Computational Imaging via Diffractive Optics

Jia Yi and Huilin Jiang
School of Science and School of Photoelectrical Engineering, Changchun University of Science and Technology,

In this work, a diffractive optical method of microstructure is investigated to realize computational imaging quality having an ultrahigh sensitivity.

- This method can achieve the video detection of high spatial resolution, high SNR, high spectral resolution and high temporal resolution.
- Overcome the limitations of all previous approaches utilizing a diffractive-filter array.
- The feasibility of the method is verified with theoretical analysis and tests.



Graphic Abstract

Notes

Technical Special Session 18
Manufacturing and Measurement of Micro/Nano-Scale Optical Waveguides (ss)

Room 5

15:50–17:50 Wednesday, 15 August

Organizer: Degui Sun

Co-Chair: Changming Chen

18-4 16:50–17:10

Study of the Fiber-Waveguide Coupling Caused Insertion Loss and Polarization Dependent Loss

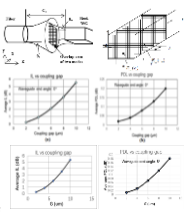
Liyuan Chang[1], Xiangyu Sun[1] , Hongpeng Shang[1] , Xihe Zhang[1], Peng Liu[2] , Trevor J.Hall[2] , and DeGui Sun[1,2,*]

1) Schools of Science / OE Engineering, Changchun University of Science and Technology, 7089 Weixing Road, Changchun 130022, China

2) Centre for Research in Photonics, University of Ottawa, 25 Templeton Street, Ottawa, K1N6N5, Canada

*Corresponding author: sundg@cust.edu.cn

- The polarization dependent loss caused by the waveguide-fiber end-face coupling depends on three main factors: the shape of the waveguide end face, the roughness, and the waveguide-fiber alignment state.
- The polarization-dependent loss is closely related to the insertion loss. With high insertion loss, the polarization-dependent loss also increases.
- For the two cases: this interface reflection is (i) involved and (ii) eliminated, the resulting numerical PDL values are 1.08dB and 0.06dB, respectively.
- Using the BPM software, the tilt angle of the waveguide is 0° and the roughness is 100nm and 200nm. The x and y distribution of light field in the TE mode is obtained.



Graphic Abstract

Notes

18-5 17:10–17:30

Investigation for the Thermal Conduction of Silicon Oxide Waveguide Optical Switch

Qingyu Sun, DeGui Sun*

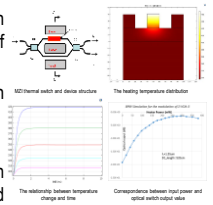
School of Science, Changchun University of Science and Technology, China

E-mail: sundg@cust.edu.cn

- The influence of device structure on diffusivity in heat conduction process and the dependence of optical switching speed on device structure.
- Study and establish the relationship between device structure and optical switching power:

$$V_h^2 = (\rho_s \frac{L_h}{W_h \cdot t_h}) \cdot (\rho_h \frac{L_h \cdot W_h}{t_{wg}}) \Delta T = (\rho_s \rho_h \frac{L_h^2}{t_{wg} \cdot t_h}) \Delta T$$

- Optimum range of performance parameters such as optical loss, polarization dependent loss, and optical output signal contrast.



Graphic Abstract

Notes

18-6 17:30–17:50

Study on Polarization State Transition of Single-mode SOI Curved Optical Waveguide Using FDTD

Yunjie Shi [a], and DeGui Sun [a,b*]

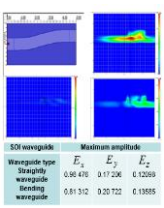
[a] School of Science and School of Photoelectrical Engineering, Changchun University of Science and Technology, 7089 Weixing Road, Changchun, JL 130022, China

[b] Centre for Research in Photonics, University of Ottawa

Ottawa ON, K1N 6N5, Canada

* sundg@cust.edu.cn

- The OptiwaveFDTD software simulates the polarization conversion of a single-mode SOI waveguide
- The conversion efficiency of SOI curved waveguide Ex to Ey is higher than that of Ex to Ez
- The change and control of PLC attenuator PDL performance can be realized without additional manufacturing process.



SOI waveguide	Maximum amplitude		
Waveguide type	E_x	E_y	E_z
Straightly waveguide	0.96 478	0.17 296	0.12059
Bending waveguide	0.81 312	0.20 722	0.13585

Graphic Abstract

Notes

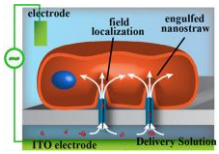
Technical Special Session 19
Nanosensor and Bioelectronics
Room 6
15:50–17:50 Wednesday, 15 August
Organizer: Xi Xie
Co-Chair: Gen He

19-1 15:50–16:07

IEEE 3M-NANO 2018
Nanoneedle array-based biomedical devices for drug delivery applications

Xi Xie
Sun Yat-sen University, China

- Introduction of biomolecules across the cell membrane with high efficiency is a challenging yet critical technique in biomedicine.
- We developed a nanoneedle-electroporation platform to achieve highly efficient molecular delivery and high transfection yields with excellent uniformity and cell viability.



Notes

19-2 16:07–16:24

Self-powered Medical Electronic Devices

Zhou Li
Nanoenergy and biosystem Lab (NBL)
Beijing Institute of Nanoenergy and Nanosystems, CAS, China

- Piezoelectric nanogenerator（PENG）
- Triboelectric nanogenerator (TENG)
- An implantable TENG (iTENG) in a living animal has been developed to harvest energy from its periodic breathing.
- It showed broad clinical applications of implantable self-powered medical systems for disease detection and health care.

Fig1. Implantable Self-powered cardiac sensor based on TENG

NBL Group website：www.nanobiolab.cn

Notes

19-3 16:24–16:41

Bioinspired polymer composites with sensing and actuating properties

Xuemin Du
Shenzhen Institutes of Advanced Technology (SIAT),
Chinese Academy of Sciences (CAS), Shenzhen, PR China

- Bioinspired polymers are originated from the inspiration of nature. Due to their intriguing properties, these materials have been wisely explored in various research fields.
- Here, we would like to present our recent progress on chameleon-inspired structural color materials firstly.
- Then, the Venus flytraps-like actuators, are followingly introduced. Based on the rapid progress in this field, we believe bioinspired polymers will find great potential applications in wearable and implantable devices.

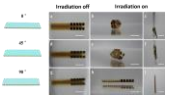


Figure 1. Self-twisting of 3D flexible electronics under the irradiation of NIR light

Notes

Technical Special Session 19
Nanosensor and Bioelectronics

Room 6

15:50–17:50 Wednesday, 15 August

Organizer: Xi Xie

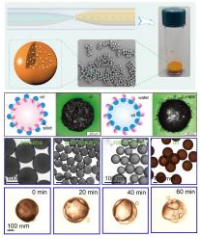
Co-Chair: Gen He

19-4 16:41–16:58

Microfluidics, Emulsions and Capsules

Dong Chen
College of Energy Engineering, Zhejiang University, China

- **Microfluidic platform** for the fabrication of emulsions with hierarchical structure.
- **Functional particles** prepared using single emulsions as templates
- **Biocompatible microcapsules** loaded with various actives
- **Programmable release** of actives from microcapsules



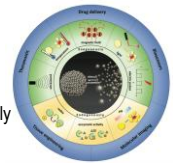
Notes

19-5 16:58–17:15

Dynamic Nanoparticle Assemblies for Biomedical Applications

Daishun Ling
College of Pharmaceutical Sciences, Zhejiang University, China

- The materials composing the nanoparticles produce fascinating and diverse functionalities [1].
- The controllable assembly would lead to the flexible modulation of nanomaterials' fate *in vivo* [2-4].
- The ligands directed self-assembly would simultaneously achieve targeted delivery, fast diagnosis, efficient therapy, and even excretion [5–9].



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2. Li F, **Ling D***, et al. *Adv. Mater.*, 2018, in press.
3. Li F, **Ling D***, et al. *Adv. Mater.*, 2017, 29: 1605897
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5. Lu J, **Ling D***, et al. *J. Am. Chem. Soc.*, 2018, in press.
6. Lu J, **Ling D***, et al. *Small*, 2017, 14: 1702037.
7. **Ling D**, et al. *J. Am. Chem. Soc.*, 2014, 136: 5647–5655.
8. Xia H, **Ling D***, et al. *ACS Cent. Sci.*, 2016, 2: 802–811.
9. Hu X, **Ling D***, et al. *Nano Lett.*, 2018, 18: 1196–1204.

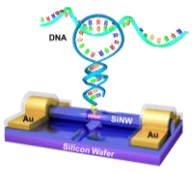
Notes

19-6 17:15–17:32

A Kinetic Study on DNA Hybridization by Silicon Nanowire-Based Single-Molecule Devices

Gen He
School of Electronics and Information Technology, Sun Yat-Sen University, China

- Fabrication of single molecule devices based on silicon nanowire field-effect transistors
- Electrical measurement of DNA hybridization dynamics with single-base resolution
- Single nucleotide polymorphisms (SNPs) discrimination in single-molecule electronic circuits



Notes

Technical Special Session 19
Nanosensor and Bioelectronics
Room 6
15:50–17:50 Wednesday, 15 August
Organizer: Xi Xie
Co-Chair: Gen He

19-7 17:32–17:50

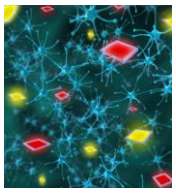
Microscale, Implantable Devices for Advanced Optical Neural Interfaces

Xing Sheng
Department of Electronic Engineering, Tsinghua University, China

- We are interested in advanced, implantable micro- and nanoscale photonic devices for biomedical applications

Two representative topics:

- Wirelessly powered, implantable photometer for deep brain fluorescence sensing
- Microscale, optoelectronic infrared-to-visible upconversion devices as injectable light sources for neural stimulation



Notes

Technical Special Session 20

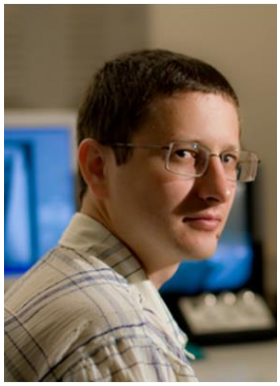
Functional Materials for Bottom up Nano-assembly (ss)

Room 7

15:50–17:50 Wednesday, 15 August

Organizer: Artemy Irzhak

Co-Chair: Victor Koledov

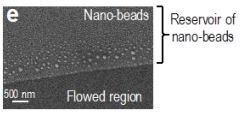


20-1 15:50–16:10

Electrical Jointing at Micro- and Nanoscale by Electromigration and Mechanical Nano-Manipulation for Bottom-Up Nano-Assembling

V, Shavrov, V. Koledov, S. von Gratowski. A, Irzhak. A, Shelyakov, P. Lega, A. Orlov, A.Frolov, A.Zhikharev
Kotelnikov IRE RAS, Moscow, Russia
P. Kumar, S.Kumar, S.Talukder, V.Shashnri,
IISc, Bangalore, India

Physical basis of the development of electrical nano-contacts for bottom-up nanointegration are studied. For the fabrication of the electrical nano-contacts it is proposed to use the electromigration of micro – and –nano-drops of metals and 3D mechanical nanomanipulation of the nanowires. The process of the melting of the micro-wires was studied under the action of laser radiation.



Electrically driven flow of liquid Bi on oxidized Cu.

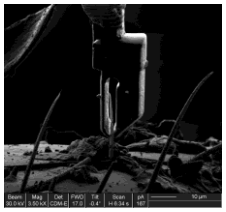
Notes

20-2 16:10–16:30

Nano-Manipulation –Manufacturing -Measurements by New Smart Materials Based Mechanical Nanotools

V. Koledov, S. von Gratowski. A, Irzhak. V, Shavrov, A, Shelyakov, P. Lega, A. Orlov, A. Mashirov
Kotelnikov IRE RAS, Moscow, Russia
V. Sampath
Indian Institute of Technology in Madras, Chenai, India

- The new functional materials with shape memory effect (SME) open possibility the design of mechanical nanotools. The natural limits of their minimal size is not established yet.
- 3D nano-manipulation makes possible treatment of any observable nano object in SEM.
- Nano robotics should advance 3D manipulation to automatic nanomanufacturing.
- Nanotools are also going to contribute to nano measurement problem.



Capture of a sensillum of Culex pipiens by composite T_2NiCu nanotweezers with SME.

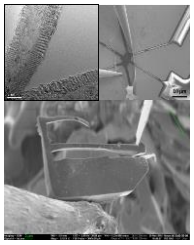
Notes

20-3 16:30–16:50

Bottom-Up Nano-integration technique for novel functionalized carbon nanotube and multi-layer graphene device fabrication

Somnath Bhattacharyya
School of Physics University of the Witwatersrand, Johannesburg, South Africa

- The study is devoted to novel bottom-up nano-electronic device fabrication using nano-manipulations techniques.
- Nano-grippers are used to manipulate single functionalized cnts for the fabrication of novel spintronic devices
- Nanomanipulating probes are used for multilayer graphene device fabrication
- Quantum transport in such devices is demonstrated



Notes

Technical Special Session 20

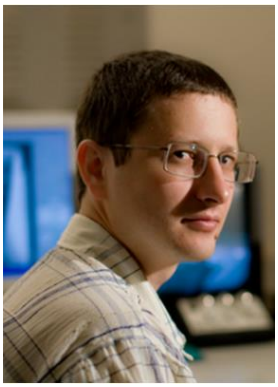
Functional Materials for Bottom up Nano-assembly (ss)

Room 7

15:50–17:50 Wednesday, 15 August

Organizer: Artemy Irzhak

Co-Chair: Victor Koledov

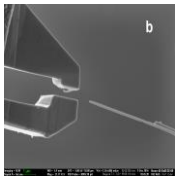


20-4 16:50–17:10

Bottom-up Nano-Assembling of Individual InP Nanowire FET for Ultrasensitive and Highly Selective Disease Biomarker Detection

Monica Cotta
University of Campinas
Gleb Wataghin Physics Institute Campinas, SP, Brazil
Victor Koledov
Kotelnikov IRE RAS Magnetic Phenomena Laboratory Moscow, Russia

New process for nano-assembling of the medical biosensors with high selectivity and sensitivity up to femtoMolar (fM) based on the nano-field-effect transistors (FET) created by manipulating of the individual InP nanowires (NWs) using shapememory composite nanotweezers. Direct, quick label-free detection possibility of several biomolecules.



Nanotweezers

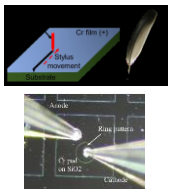
Notes

20-5 17:10–17:30

Patterning Cr Film by Passing Electric Current through a Traversing Pointy Stylus: Introduction to Electrolithography and Its Prospects

Praveen Kumar
Department of Materials Engineering Indian Institute of Science (IISc) Bangalore, India
Rudra Pratap
Centre for Nano-Science and Engineering Indian Institute of Science (IISc) Bangalore, India

Upon passage of electric current through a pointy cathode electrode placed on Cr film leads to formation and liquefaction of a Cr compound, which then flows away from the cathode in a radially symmetric fashion, thereby removing the Cr layer. We describe the process of electrolithography and finally, we discuss future prospects of electrolithography.



Principals and demonstration of electrolitography

Notes

Technical Special Session 21
University of Shanghai Cooperation Organization
Nanotechnology (ss)

Room 1

8:00–10:00 Thursday, 16 August

Chair: Peng He

Co-Chair: Zhankun Weng

21-1 8:00–8:20

Visible Light irradiation of silver nanowire transparent electrode: a double-edged sword

Peng He* and Shuye Zhang
State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, China

- The silver nanowire (AgNW) is one of the promising components for flexible electronics.
- Unlike other materials, AgNWs show unique and complicated behavior under long-term light illumination.
- A double-edged sword effect of visible light irradiation on the AgNW transparent electrode is investigated in study.
- This work contributes to the design, processing and application of transparent electrodes for optoelectronic devices

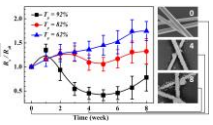


Fig.1. The changes of normalized sheet resistances (Rs/Rs0) of AgNW electrodes during the 8-week light irradiation treatment.

Notes

21-2 8:20–8:40

Nanoridge patterns on polymeric film by photocopying metallic nanowire networks

Shuye Zhang and Peng He*
State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, China

- Topographical patterns are widely applied in many manufacturing areas due to the unique role in modifying performance.
- A novel, simple and low-cost nanopatterning technique named “photocopying method” with high technological flexibility has been initially proposed in this study.
- This work plays an important role in the development of topographical nanopatterns.

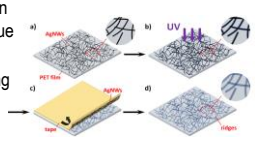


Fig.1. The schematic of ridge patterning process on PET film.

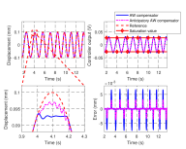
Notes

21-3 8:40–9:00

Large stroke tracking of a nanomanipulator with anticipatory anti-windup compensation of time-varying internal principle-based control

Mengjia Cui and Zhen Zhang
Department of Mechanical Engineering, Tsinghua University, China

- An anticipatory anti-windup compensator with time-varying internal principle-based control to achieve large stroke tracking for a nanomanipulator.
- The proposed control strategy experimentally implemented on the nanomanipulator achieving the tracking error of 73.03 nm without saturation.
- The anticipatory anti-windup compensator with a significant error reduction compared with the conventional anti-windup scheme.



Experimental results of the saturation compensation

Notes

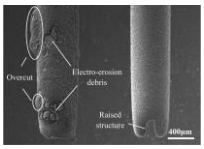
Technical Special Session 21
University of Shanghai Cooperation Organization
Nanotechnology (ss)
Room 1
8:00–10:00 Thursday, 16 August
Chair: Peng He
Co-Chair: Zhankun Weng

21-4 9:00–9:20

Electrical Discharge Machining of SiCp/2024Al Composites

Peng Yu
National and Local Joint Engineering Laboratory for Precision Manufacturing and Detection Technology
Changchun University of Science and Technology
China

- The MRR of EDM with tube electrode is significantly greater than that of with cylinder electrode
- In the EDM process, the MRM includes thermal spalling, melting/vaporization and oxidation
- As the discharge energy increases, the surface roughness of EDM increases



SEM image of the holes section processed with two kinds of electrodes

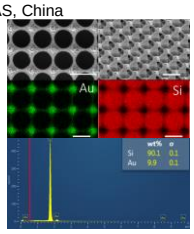
Notes

21-5 9:20–9:40

Fabrication of Three-Dimensional Si-Au Hierarchical Nanostructures by Laser Interference Lithography

Litong Dong[1], Lu Wang[1], Mengnan Liu[1], Miao Yu[1], Zuobin Wang[1,2], Ziang Zhang[2,3], Dayou Li[2]
1. JR3CN&CNM, CUST, China
2. JR3CN&IRAC, University of Bedfordshire, UK
3. Changchun Observatory, CAS, China

- This paper reports a method for the fabrication of 3D Si-Au hierarchical nanostructures by laser interference lithography and inductively coupled plasma etching.
- The 3D Si-Au hierarchical nanostructures were composed of silicon tapered pillar arrays, Au grids, and Au islands.
- The 3D structures demonstrated wide-angle antireflective properties less than 25% reflection in the entire visible wavelengths.



Surface morphologies and chemical composition of 3D hierarchical nanostructures.

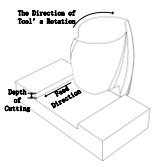
Notes

21-6 9:40–10:00

Experimental Study on Surface Roughness and Surface Micro-morphology of SiCp/Al

Wang Xu
National and Local Joint Engineering Laboratory for Precision Manufacturing and Detection Technology
Changchun University of Science and Technology, China

- In this paper, milling experiments are carried out on SiCp/Al with different cutting parameters, and the regulations of surface roughness and surface topography is obtained changing with different cutting. With the speed increasing, the surface roughness decreases and the surface becomes flater. With the feed increasing, the surface roughness increases and the surface quality is getting worse. With the depth increasing, the change of surface roughness and surface quality is not very obviously. The defects in the cutting process are analyzed and the reasons of different defects are obtained.



Milling experimental processing picture

Notes

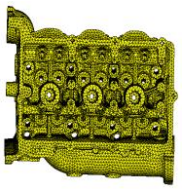
Technical Session 22
NEMS and their Applications
Room 2
8:00–10:00 Thursday, 16 August
Chair: Lu Wang
Co-Chair: Yuanqing Huang

22-1 8:00–8:20

Free modal analysis of cylinder cover of pressurized straight jet

Qianyi Yu ,Yonghua Wang
College of Mechanical and Electric Engineering, Changchun University of Science and Technology,Changchun 130025,China

- In this paper, the strength and stiffness of the structure are analyzed by finite element method, and the finite element model is established for static strength analysis and finite element modal analysis.
- The feasibility and reliability of the structure are confirmed.
- It provides a theoretical reference for subsequent casing design



The finite element mode

Notes

22-2 8:20–8:40

Application of Adaptive Federated Filter Based on Innovation Covariance in Underwater Integrated Navigation System

Xiaoshuang Ma[1,2], Tongwei Zhang[3], Xixiang Liu[1,2]*
1.School of Instrument Science and Engineering, Southeast University, China
2.Key Laboratory of Micro-Inertial Instrument and Advanced Navigation Technology, Southeast University, China
3.National Deep Sea Center, China

- This paper presents an adaptive federated filtering method based on innovation covariance.
- The popular real-time estimation of innovation covariance is derived in according to (MLE) criterion.
- A scaling factor is introduced in each local filter to modify the filter gain directly.
- Simulations and analysis verify its improved adaptive ability in the presence of measurement noise uncertainty.

Notes

22-3 8:40–9:00

Analysis of Vibration Noise of A Certain Type of Turbocharged Direct Jet Engine Complete Machine

Fengyu Xu[1] ,Yonghua Wang[2*]
College of Mechanical and Electric Engineering, Changchun University of Science and Technology,Changchun 130025,China

- This paper used the 3D modeling software Pro/E to build the mathematical model of a high speed engine.
- Calculated by combining finite element theory with multi-body dynamics.
- The vibration response characteristics of the engine complete machine and internal loads were further studied.

Finite element model of engine complete machine (excluding moving parts).

Notes

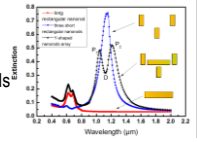
Technical Session 22
NEMS and their Applications
Room 2
8:00–10:00 Thursday, 16 August
Chair: Lu Wang
Co-Chair: Yuanqing Huang

22-4 9:00–9:20

Sensing characteristics of Fano resonances in Y-shaped gold nanorods array

Li Wang, Yanbing Leng, Yanjun Sun*
School of Opto-Electronic Engineering, Changchun University of Science and Technology, Changchun, China

- Fano interference of metallic nanostructure is an effective way to reduce the irradiation loss and improve the spectral resolution.
- We designed a kind of Y-type gold periodic nanorods array, which has obvious Fano resonance phenomenon at 1.12-μm wavelength.
- The Y-type gold nanoarray structures have better sensing characteristics, and its figure of merit is 10.68.



Extinction spectra of the structures

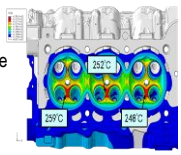
Notes

22-5 9:20–9:40

Analysis of Temperature Field in Cylinder Head and Cylinder Block of Engine

Wu Haiquan,Wang Yonghua*,Liu Zheming,Xu Jinkai,Yu Huadong
College of Mechanical and Electric Engineering, Changchun University of Science and Technology，Changchun

- The engine must meet the requirements of reliability and durability.
- The temperature field of cylinder block and cylinder head of a gasoline engine is analyzed based on finite element method.
- Temperature Analysis of engine with ANSYS Software.
- The experimental study of cylinder head and cylinder block is of great significance to the improvement of its strength, cooling effect, and the provision of boundary conditions for simulation calculation.



Temperature field distribution of cylinder head

Notes

22-6 9:40–10:00

Calculation and optimization of the cover model of an engine valve chamber

Wen Cheng, Huadong Yu
College of Mechanical and Electric Engineering, Changchun University of Science and Technology， Changchun，China

- The original plan and improve the right cover assembly state of the first order modal vibration mode as shown in figure 4 You can see from the figure, compared with the original scheme, the improved scheme left valve chamber cover frequency 1676 hz increased by 6.28% than the original case;The first-order modal frequency of the right valve chamber cover is 1729Hz, which is increased by 14.88% than the original case 1505Hz.

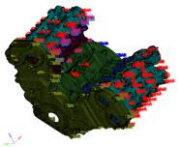


Fig. Finite element model for assembly of engine valve chamber cover

Notes

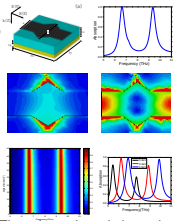
Technical Session 22
NEMS and their Applications
Room 2
8:00–10:00 Thursday, 16 August
Chair: Lu Wang
Co-Chair: Yuanqing Huang

22-7 Poster1

Tunable Terahertz Metamaterial Absorber with High Absorptivity

Jianxun Song[1], Yongzhao Xu[1], Chang Yang[2], Dongxiong Ling[1], Dongshan Wei[1], Yun Shen[2]
1 School of Electrical Engineering & Intelligentization, Dongguan University of Technology, Dongguan, China
2 school of science, Nanchang University,Nan chang ,China

- we present a graphene-based metamaterial absorber, which has two high absorptivity.
- The electric field distribution and absorption spectra are analyzed using the 3D electromagnetic simulation method.
- It provides an important guide for processing parameters of dual-band metamaterial absorber.
- It provides data support for the application of graphene-based metamaterial absorber.



The schematic and absorption spectra of metamaterial absorber

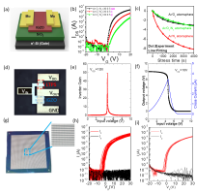
Notes

22-8 Poster2

Enhancing Performance in Thin Film Transistors with Vacuum or Solution Processed Amorphous Oxide Semiconductors Towards Display Applications

Changdong Chen, Gongtan Li, Minmin Li, Bo-Ru Yang, Han-Ping D. Shieh and Chuan Liu*
School of Electronics and Information Technology, Sun Yat-Sen University

- Gate bias stability of IGZO TFT is improved by N-doping
- Hybrid CMOS constructed by IGZO and LTPS presents high voltage gain and low consumption.
- An additive patterning method of metal oxide semiconductor is proposed, demonstration of wafer-scale TFT arrays are given



Notes

Technical Special Session 23
Fiber-based Elements and Nonlinear Optics (ss)

Room 3

8:00–10:00 Thursday, 16 August

Organizer: Dong Mao

Co-Organizer: Yongkang Gong

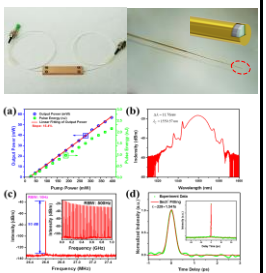
23-1 8:00–8:20

Saturable absorber fabrication and application in ultrafast pulse laser

Peiguang YAN

College of Optoelectronic Engineering, Shenzhen University, China

- We utilized PVD/CVD/LPE methods to fabricate novel saturable absorbers (SAs) with the merits of all-fiber integrated, high modulation depth and high power tolerance.
- High energy wave-breaking free soliton pulses were generated at 1.5 μm regime and 2 μm regime, respectively.
- These work suggested that our SAs could be used as an excellent photonic device for ultrafast pulse generation.



SAs and the laser performance

Notes

23-2 8:20–8:40

Recent advances in 2D materials-based multi-wavelength ultrafast lasers and phenomenon

Bo Guo

Key Lab of In-Fiber Integrated Optics, Ministry Education of China, Harbin Engineering University, China

- 2D materials-based nonlinear optical devices for multi-wavelength ultrafast photonics.
- By introducing them into the fiber laser, we demonstrated the versatile multi-wavelength ultrafast lasers and phenomenon.
- 2D material can be as an excellent nonlinear materials with rich physical connotation and application prospect.

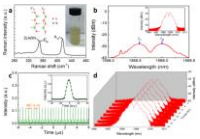


Figure. Demonstration of dual-wavelength soliton pulse and 2D material characterization.

Notes

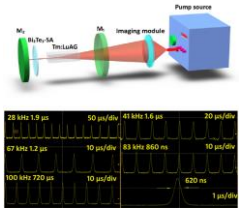
23-3 8:40–9:00

Low-dimention Nano-materials as Broadband Saturable Absorber for Mid-infrared Solid-state Lasers

Kejian Yang

Institute of Crystal Materials, Shandong University, China

- Broadband optical absorption ability of nano-materials based saturable absorber (SA) covering from visible to mid-infrared spectral band
- Simple fabrication, low-cost and compact structure making nano-material based SA superior to the traditional ones
- Generation of watt-level average power and several hundred kHz repetition rate laser pulses in a compact laser oscillator



Schematic setup of pulsed laser and generated laser pulses based on Bi_2Te_3 nanosheets

Notes

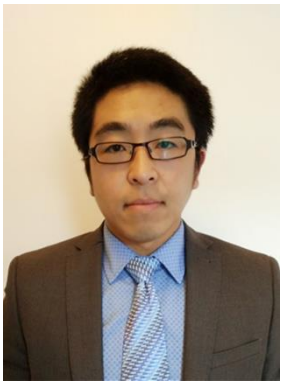
Technical Special Session 23
Fiber-based Elements and Nonlinear Optics (ss)

Room 3

8:00–10:00 Thursday, 16 August

Organizer: Yongkang Gong

Co-Organizer: Dong Mao



23-4 9:00–9:20

A Novel Comb Filter Based on Tapered-drawing Fiber Bragg Grating

Xiaojun Zhu
School of Electronics and Information, Nantong University, China

- A bandwidth tunable Mach-Zehnder interferometer (MZI) based on tapered-drawing fiber Bragg grating.
- MZI is the structure that the both sides are symmetrical tapered chirp long-period grating.
- The bandwidth can be tuned by changing the solution concentration of NaCl.
- The adjustable accuracy is 0.64318 nm-1/RIU by detecting the bandwidth at 1550 nm of transmission.

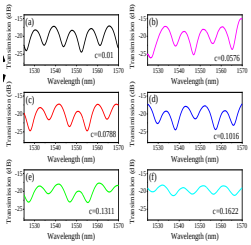


Figure 1 The transmissions of MZI with different concentration of the NaCl

Notes

23-5 9:20–9:40

Nonlinear optical effects and applications in silicon-on-insulator(SOI) structures

Jin Wen
School of Science, Xi'an Shiyou University, China

- Widely tunable femtosecond pulses with smooth time domain and spectra are obtained from silicon-based OPA/OPO.
- SC generation including dispersive wave emission and soliton trapping in SOI waveguide are investigated.
- OFCs' generation and evolution based on cascaded FWM in SOI micro-ring resonator have been analyzed and discussed.
- Nonlinear optical effects and applications in SOI structures have been described.

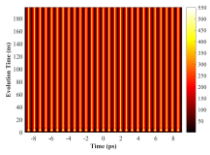


Fig. 1 The evolution of OFC in time domain based on SOI micro-ring resonator

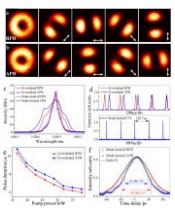
Notes

23-6 9:40–10:00

All-fiber pulsed vortex laser and cylindrical vector laser

Dong Mao
School of Science, Northwestern Polytechnical University, China

- A mode converter with an insertion loss of 0.36 dB is demonstrated based on mode coupling of tapered single-mode and two-mode fibers, and realize all-fiber flexible cylindrical vector lasers at 1550 nm.
- We proposed three fiber lasers that are able to generate mode-locked and continuous-wave vortex beams based on the modulation of transversal modes in fibers.
- These work paves the way to flexible cost-effective all-fiber vortex and cylindrical vector lasers.



Q-switched and mode-locked cylindrical vector laser

Notes

Technical Session 24
Nanofabrication and Nanocharacterization

Room 4

8:00–10:00 Thursday, 16 August

Chair: Yang Jing

Co-Chair: Ziang Zhang

24-1 8:00–8:20

Nanofabrication Techniques Used for Suppressing Multipactor in Space Applications

Jing Yang

National Key Laboratory of Science and Technology on Space Microwave
Xi'an, China

- Multipactor discharge is a significant trouble in space applications, Nanofabrications in this thesis can suppress multipactor effectively.
- The influence of surface characteristic on SEY is discussed to find that increase porosity and aspect ratio will reduce SEY.
- These results in this paper provid a criterion to determine nanofabrication techniques for multipactor suppression.

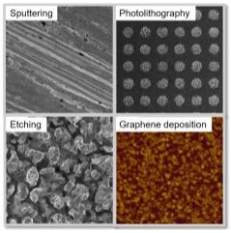


Fig.1 Engineered surfaces by nanofabrication techniques.

Notes

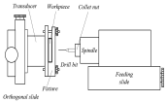
24-2 8:20–8:40

An Experimental Study of Ultrasonic Assisted Micro-Holes Drilling

Guangjun Chen

College of Mechanical and Electric Engineering,
Changchun University of Science and Technology,
Changchun, Jilin Province, China

- This paper applied the ultrasonic vibration to the micro-holes drilling （UAMD）on 30CrNiMo8.
- An ultrasonic machine tool with the vibration in the feed direction was designed .The feed rate and the spindle speed were taken as the controlled variables.
- The results indicated that UAMD improves the stiffness and reduces the axial resistance of the drill bit, which noticeably suppresses the exit burrs, ensures the dimensional accuracy and the surface roughness of the micro-holes.



Ultrasonic cell schematic

Notes

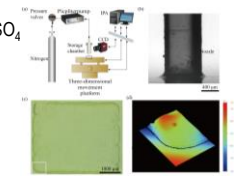
24-3 8:40–9:00

3D printing of micro electrolyte film by using micro-pen-writing

Yufang Zhao

School of Mechatronic, Northwestern Polytechnical University, China

- Micron-scaled electrolyte film of the PVA-H_2SO_4 polymer has received substantial attention.
- A problem, with the suitable thin-film is rare because of the high viscosity, was solved.
- A film, with the thickness down to 4 μm, was printed by using micro-pen-writing.
- This paper shows a promising way for printing micro sandwich structures for energy storage.



Schematic diagram of the micro-pen-writing technology.

Notes

Technical Session 24
Nanofabrication and Nanocharacterization

Room 4

8:00–10:00 Thursday, 16 August

Chair: Yang Jing

Co-Chair: Ziang Zhang

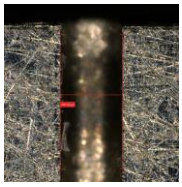
24-4 9:00–9:20

Study on Discharge Gap of Micro-EDM of the Micro Hole in Titanium Alloy

Guangsheng Ma

National and Local Joint Engineering Laboratory for Precision Manufacturing and Detection Technology,
Changchun University of Science and Technology, China

- The peak voltage is the most important factor affecting the discharge gap
- The discharge gap increases with the raise of the peak current
- Too large or too small pulse width or Pulse interval will increase the discharge gap



Side profile of micro hole

Notes

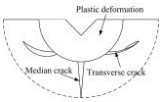
24-5 9:20–9:40

Study on Surface Integrity of Mn-Zn Ferrite in Ultraprecision Machining

Bingge Li

College of Mechanical and Electric Engineering,
Changchun University of Science and Technology,
Changchun, Jilin Province, China

- This paper primarily analyzed the mechanism of crack propagation in brittle materials micro-grinding,and obtained the empirical formula of the maximum unreformed thickness.
- We compare the different processing methods in order to study the effect of different processing methods on the surface quality.
- It can be concluded that in the case of smaller depth of cut, micro- grinding is easier to obtain high-quality machined surface than micro-milling.



The model of crack propagation

Notes

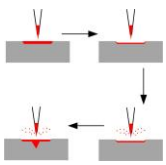
24-6 9:40–10:00

Experimental Study on Bionic Groove Structure by Nanosecond Laser

Chuanwen Xi

National and Local Joint Engineering Laboratory for Precision Manufacturing and Detection Technology, Changchun University of Science and Technology, China

- The effects of laser processing power on groove width and depth under three different scanning speeds were studied.
- The changed in hydrophobic property on modified samples was due to the formation of bionic groove microstructure and the content of surface chemical elements.
- The width and depth of the groove structure are proportional to the laser power and inversely proportional to the scanning speed .



Laser processing four stages

Notes

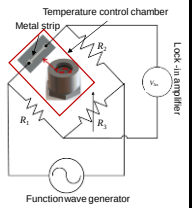
Technical Session 24
Nanofabrication and Nanocharacterization
Room 4
8:00–10:00 Thursday, 16 August
Chair: Yang Jing
Co-Chair: Ziang Zhang

24-7 Poster1

A Method of Studying the Effect of Thermal-stress Coupling on the Thermal Conductivity of the Film

Zhibin Li, Hairong Wang
State Key Laboratory for Manufacturing Systems Engineering ,
Xi'an Jiaotong University , China

- Designing a film stress device which can apply stress to the film attached to substrate
- It can adjust the strain by controlling the feed displacement of the device
- The testing system is designed by combining the film stress device with the 3ω method
- It can study the effect of thermal-stress coupling on the thermal conductivity of the film



The schematic of 3ω testing system

Notes

Technical Special Session 25
Micromachines and Devices (ss)

Room 5

8:00–10:00 Thursday, 16 August

Organizer: Li Zhang

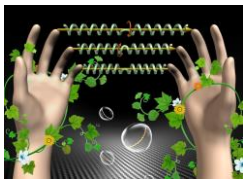
Co-Chair: Bin Dong

25-1 8:00–8:20

Mechanical Properties of Micro-/Nano-helices for MEMS/NEMS

Lu Dai
School of Mathematics and Physics,
Suzhou University of Science and Technology, China

- Long-range linear elasticity and mechanical instability of self-scrolling binormal nanohelices under a uniaxial load
- Mechanically tough, elastic and stable rope-like double nanohelices
- Controllable rotational inversion in nanostructures with dual chirality



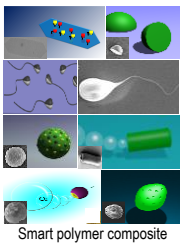
Notes

25-2 8:20–8:40

Smart Polymer Composite Based Micromotor

Bin Dong
Institute of Functional Nano & Soft Materials (FUNSOM), Soochow University, P. R. China

- Various micromotors based on smart polymers are fabricated by top-down, bottom-up nanotechnologies or their combinations.
- Unique propulsion mechanisms and motion control methodologies utilizing the stimuli-responsibilities of the components are studied.
- Unprecedented properties and potential applications in sensing, logic gate and smart window are demonstrated.



Smart polymer composite based micromotor

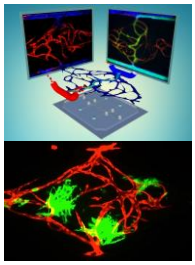
Notes

25-3 8:40–9:00

Perfused Vascularized Organ-on-a-Chip and its Application in Anticancer Drug Screening

Xiaolin Wang
Department of Micro/Nano Electronics, Shanghai Jiao Tong University, China

- Enhanced microfluidic system with controllable microenvironment was established for robust medium perfusion and hydrogel loading
- An intact and perfusable microvascular network was developed without non-physiological leakage
- 3D vascularized micro tumor (VMT) model was developed by co-culturing tumor spheroids and microvascular network
- High throughput platform with multiple VMTs was developed for anticancer drug screening



Notes

Technical Special Session 25
Micromachines and Devices (ss)
Room 5
8:00–10:00 Thursday, 16 August
Organizer: Li Zhang
Co-Chair: Bin Dong

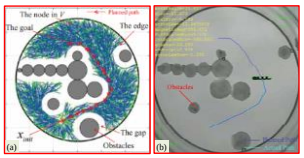
25-4 9:00–9:20

Automatic Manipulation For Miniature swimming robots towards Medical Applications

Tiantian XU[1,2], Jia LIU[1,2,3], Xinyu WU[1,2]

[1]Guangdong Provincial Key Laboratory of Robotics and Intelligent System, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, China
[2]CAS Key Laboratory of Human-Machine Intelligence-Synergy Systems, Shenzhen Institutes of Advanced Technology, Shenzhen, China
[3]University of Chinese Academy of Sciences, Beijing, China

- A global path planner called optimal Rapidly-exploring Random Tree (RRT*) is implemented to plan a path from the start to the goal.
- RRT* can arrive at asymptotic optimality as more points are sampled by rewiring the tree.
- A closed-loop control method for arbitrary planar path following using image-based visual servo is developed.
- Path planner and path following are achieved by experiments.



(a) path planner (b) path following

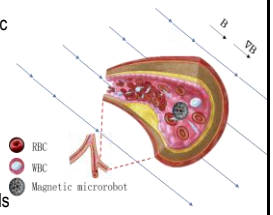
Notes

25-5 9:20–9:40

Development of An Enhanced Electromagnetic Microrobotic Manipulation System

Fuzhou Niu
Department of Mechanical Engineering,
Suzhou University of Science and Technology, China

- Develop an electromagnetic microrobotic manipulation system with desired generated magnetic field.
- Enhance the system to have a large workspace.
- Establish and calibrate the modeling of the generated magnetic field.
- Perform trajectory tracking of microbeads using the system.



Notes

Technical Special Session 26
2D Materials at Nanoscale: from Fundamentals to Applications (ss)

Room 6

8:00–10:00 Thursday, 16 August

Organizer: Zegao Wang

Co-Organizer: Aslan H üsn ü

26-1 8:00–8:20

Transition metal chalcogenides for electrocatalytic hydrogen evolution from water

Fei Qi
School of Optoelectronic Engineering, Chongqing University of Posts and Telecommunications, P. R. China

- $CoSe_2$-$SnSe_2$ hollow cube nanoboxes were synthesized by a facile aqueous reaction.
- $CoSe_2$-$SnSe_2$ combined with graphene and CNT constructs pomegranate-like and pearl-bracelet-like nanostructure, respectively.
- $CoSe_2$-$SnSe_2$/graphene and $CoSe_2$-$SnSe_2$/CNT composites exhibit superior electrocatalytic hydrogen evolution performance with small Tafel slope.

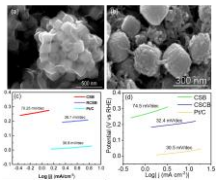


Figure 1. SEM images of $CoSe_2$-$SnSe_2$/graphene (a) and $CoSe_2$-$SnSe_2$/CNT (b), Tafel plots of $CoSe_2$-$SnSe_2$/graphene (c) and $CoSe_2$-$SnSe_2$/CNT (d).

Notes

26-2 8:20–8:40

Novel devices based on 2D perovskite

He Tian
Institute of microelectronics, Tsinghua University, China

- Organic−inorganic hybrid perovskites have emerged as a potential low-cost, earth-abundant semiconductor.
- In this talk, we will introduce resistive memory and photodetector based on 2D perovskite/graphene heterostructures.
- The 2D perovskite-based resistive memory shows record low operation current down to 10 pA.
- The 2D perovskite-based photodetector shows high photo-responsivity and good stability.

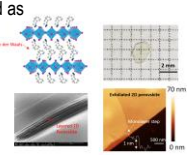


Figure 1: 2D perovskite crystal structure, optical image, SEM and AFM.

Notes

26-3 8:40–9:00

Electrical transport behavior of two dimensional materials

Zegao Wang, Mingdong Dong
Interdisciplinary Nanoscience center, Aarhus University, Denmark

- Tungsten diselenide (WSe_2) has many excellent properties and provide superb potential in applications of valley-based electronics, spin-electronics and optoelectronics.
- In this talk, we will introduce the electric field screening and transport properties of WSe_2 transistor with thickness rang from 1 layer to 40 layers.
- The ambipolar transport behavior of WSe_2 transistor is studied by gated Kelvin probe force microscopy.

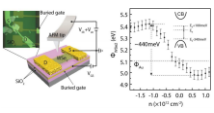


Figure 1: schematic diagram of the setup and the work function of WSe_2 as a function of carrier concentration.

Notes

Technical Special Session 26
2D Materials at Nanoscale: from Fundamentals to Applications (ss)

Room 6

8:00–10:00 Thursday, 16 August

Organizer: Aslan Hüsnü

Co-Organizer: Zegao Wang

26-4 9:00–9:20

Field Effect Transistor with 2D materials: Intentional and Unintentional Doping

Taisong Pan
School of Electronic Science and Engineering
University of Electronic Science and Technology of China, China

- The effect of selenium substitution on activation energy of $SnS_{2-x}Se_x$ was observed;
- The increasing selenium content suppresses the drain-source current of FET with $SnS_{2-x}Se_x$ conduction channel;
- The desorption of unintentional dopants with self-heating effect leads to the shift of charge neutrality point of graphene FET.
- Higher thermal conductivity of dielectric layer can significantly improve the stability of graphene FET.

Notes

26-5 9:20–9:40

Novel Dopant for Hole-Transporting Materials in Perovskite Solar Cells

Zhongquan Wan
School of Electronic Science and Engineering, University of Electronic Science and Technology of China, China

- A fluorine-containing hydrophobic Lewis acid can be employed as an effective dopant for hole-transporting material.
- The hysteresis of perovskite solar cells is clearly reduced.
- The stability against ambient conditions is unprecedentedly enhanced with novel dopant.
- This work opens up a new approach for designing hydrophobic dopants for perovskite solar cells.

Notes

Technical Special Session 27
Micro/nano Materials and Structures for Photonics and Quantum Optics (ss)

Room 7

8:00–10:00 Thursday, 16 August

Organizer: Leiran Wang

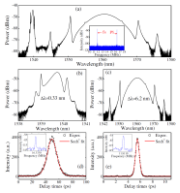
Co-Chair: Qibing Sun

27-1 8:00–8:20

Ultrafast fiber laser mode-locked by carbon nanomaterial

Dongdong Han
School of Electronic Engineering, Xi'an University of Posts&Telecommunications, China

- Carbon nanotubes are promising for ultra-short pulse generation with the intrinsic advantages
- We propose a compact nanotube-mode-locked all-fiber laser that can simultaneously generate picosecond and femtosecond solitons.
- Numerical results agree well with the experimental observations.
- The proposed all-fiber laser can provide two different pulse sources, which is convenient and attractive for practical applications.



Output of the simultaneous picosecond and femtosecond solitons.

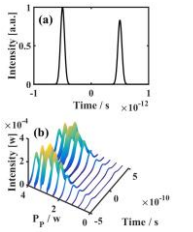
Notes

27-2 8:20–8:40

Nonlinear optical effects and its applications in micro-nano structures

Q. B. Sun, L. R. Wang, W. F. Zhang, G. X. Wang and C. Zeng
State Key Laboratory of Transient Optics and Photonics,
Xi'an Institute of Optics and Precision Mechanics of CAS, China

- Four-wave mixing and stochastic resonance in micro-nano structures were demonstrated.
- Restoration of noise-hidden signals via stochastic resonance was realized.
- Time lens and broadband OFC generation via four-wave mixing were realized.
- These results have potential applications in ultrafast optics, integrated optics, optics communications, spectroscopy, etc.



(a) Input pulse and (b)output pulse via time lens at different pump powers

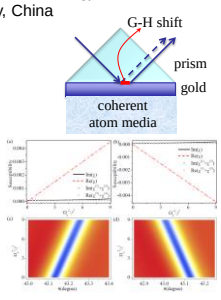
Notes

27-3 8:40–9:00

Tunable Goos-Hänchen shift owing to surface plasmon resonance controlled by quantum interference

Ren-Gang Wan
School of Physics and Information Technology,
Shaanxi Normal University, China

- Coherent atom media is utilized to manipulate surface plasmon resonance
- Goos-Hänchen shift of reflected light is enhanced owing to surface plasmon resonance
- G-H shift can be controlled via quantum interference effect
- The proposed scheme has potential application in optical sensor and optical switching.



Notes

Technical Special Session 27
Micro/nano Materials and Structures for Photonics and Quantum Optics (ss)

Room 7

8:00–10:00 Thursday, 16 August

Organizer: Leiran Wang

Co-Chair: Qibing Sun

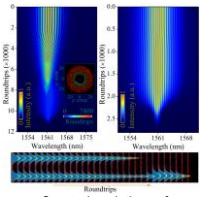
27-4 9:00–9:20

A Real-Time Spectrometer for Fast Continuous Single-Shot Measurements

C. Zeng, G. M. Wang, G. W. Chen, W. L. Li, and W. Zhao

State Key Laboratory of Transient Optics and Photonics, Xi'an Institute of Optics and Precision Mechanics, CAS, China

- A simple technique, dispersive Fourier transform (DFT), is explored for real-time optical spectral measurement.
- The spectrometer is a special tool for single-shot spectral capturing of ultrafast pulsed lasers.
- The spectral dynamics of mode-locked fiber lasers have been resolved at the frame rate of ~20 MHz.
- Several interesting phenomena were observed which can never be discovered by traditional OSA.



Spectral evolutions of double-pulse mode-locking

Notes

27-5 9:20–9:40

Micronano Fabrication Technology for Photodetector with High Area-Bandwidth Product

Fei Yin

Key Laboratory of Ultrafast Photoelectric Diagnostics Technology, Xi'an Institute of Optics and Precision Mechanics, CAS, China

- Micronano fabrication technology
- Lithography technology and nano-embossing processing technology platform
- Photodetector technology with high area-bandwidth product
- The ultrafast all-optical solid-state framing camera

Notes

Technical Special Session 28
Design and Application of Piezoelectric Actuators (ss)

Room 1

10:20–12:20 Thursday, 16 August

Organizer: Hu Huang

Co-Chair: Takeshi Morita

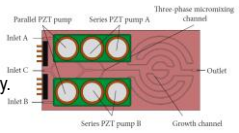
28-1 10:20–10:37

Application Research of Piezoelectric Driving Technology in Microfluid Pumping, Micromixing and Particle Separation

Guojun Liu

School of mechanical and aerospace engineering, Jilin University, China

- PZT micropump can realize the precise delivery of micro fluid, such as insulin.
- PZT micromixer can achieve multi-phase flow pulsating micromixing by high mixing efficiency.
- As one of PZT materials, LiNbO3 wafers are used to manufacture microfluidic chip.
- Combined with acoustic separation and hydraulic separation technology, a multi-stage separation chip was developed.



Schematic of three-phase flow pulsating micromixing chip

Notes

28-2 10:37–10:54

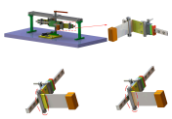
An inertial piezoelectric hybrid actuator with large angular velocity and high resolution

Huilu Bao,[1] Jianming Wen,[1,a)] Kang Chen,[2] Jijie Ma, [1] Dan Lei,[1] and Jiajia Zheng[1]

[1]Institute of Precision Machinery, Zhejiang Normal University, Jinhua, China

[2] Graduate School of Frontier Sciences, The University of Tokyo, Tokyo, Japan

An inertial piezoelectric actuator with large angular velocity and high resolution equipped with various combinations of asymmetrical clamping structures and a bias unit is presented. Two control types are constructed as types A and BThe first-order natural frequency by simulation is 16.666 and 17.379 Hz for types A and B, respectively, which agrees with the experiment results of 13.828 and 14.141 Hz. Furthermore, for type A, compared with the characteristics of the actuator that has a sole asymmetrical clamping structure, angular velocity is improved to approximately 6.90 times from 18.88 mrad/s to 130.23 mrad/s at 50 V and 7 Hz. For type B, the resolution is enhanced to 2.85 times from 7.98 μrad to 2.80 μrad under a square signal of 20 V and 1 Hz and offset distance of –22 mm. Thus, type A can improve angular velocity and type B can enhance resolution.



Main structure of the actuator

Notes

28-3 10:54–11:11

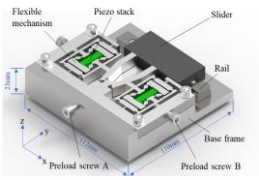
A translational stick-slip piezoelectric actuator based on parasitic motion and flexible mechanism

Jiru Wang, Hongwei Zhao*, Mingxing Zhou, Zhi Xu

School of Mechanical Science and Engineering

Jilin University, China

- A parasitic piezoelectric actuator is designed and tested.
- Finite element analysis is adopted to characterize the flexure mechanism.
- MATLAB/Simulink is adopted to calculate kinetic model of the actuator.



3D model of the actuator

Notes

Technical Special Session 28
Design and Application of Piezoelectric Actuators (ss)

Room 1

10:20–12:20 Thursday, 16 August

Organizer: Hu Huang

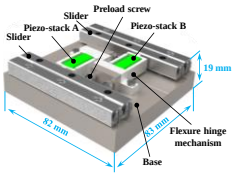
Co-Chair: Takeshi Morita

28-4 11:11–11:28

Design and Performance Evaluation of a Novel Centrosymmetric-type Stick–slip Piezoelectric Linear Actuator

Feng Qin, Hongwei Zhao*, Jiru Wang, Hu Huang
School of Mechanical Science and Engineering
Jilin University ,China

- A stick-slip piezoelectric linear actuator using a centrosymmetric-type flexure hinge mechanism is designed and tested.
- Finite element analysis (FEA) is adopted to analysis the flexure hinge mechanism.
- The backward motion of the actuator is inhibited obviously.



3D solid model of the actuator

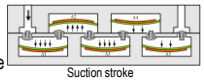
Notes

28-5 11:28–11:45

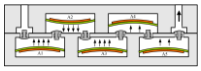
A Multichamber Check-Valve Piezoelectric Pump with Multiple Actuators

Zhonghua Zhang
Institute of Precision Machinery, Zhejiang Normal University, China

- A multichamber piezoelectric pump with simultaneous occurrence of serial/parallel forms is presented.
- Various serial-parallel modes of multichamber piezoelectric pumps offer larger flexibility of flowrate and backpressure.
- Influence on the flowrate and backpressure of a serial-parallel hybrid multichamber pump is researched.



Suction stroke



Discharge stroke

A schematic of a multichamber pump with a series combination of unequal-volume chambers

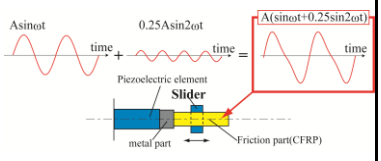
Notes

28-6 11:45–12:02

Resonant frequency control method for R-SIDM (Resonant type SIDM)

Takeshi Morita
Graduate School of Frontier Sciences, The Univ. of Tokyo, Japan

- Resonant type SIDM (Smooth Impact Drive Mechanism) is one of the stick-slip actuators. It utilizes two resonant vibration modes whose resonant frequency ratio is 1:2.
- Using resonant excitation, lower voltage drive and less temperature increase can be realized.
- For efficient operation, we propose a dynamic resonant frequency control method.



Driving principle for Resonant-type SIDM

Notes

Technical Special Session 28
Design and Application of Piezoelectric Actuators (ss)

Room 1

10:20–12:20 Thursday, 16 August

Organizer: Hu Huang

Chair: Takeshi Morita

28-7 12:02–12:20

On the Suppression of Backward Motion of a PMP Piezo-driven Positioning Platform

Hu Huang

School of Mechanical Science and Engineering, Jilin University, China

- A specific arc-shape flexure hinge was designed to suppress the backward motion of a PMP piezo-driven positioning platform.
- Under a critical initial gap of 130 μm, the positioning platform could output stepping displacement without backward motion.
- Under this critical initial gap, the effects of the driving voltage and frequency on the backward motion were further investigated.

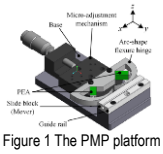


Figure 1 The PMP platform

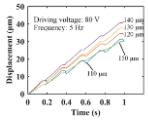


Figure 2 The critical initial gap

Notes

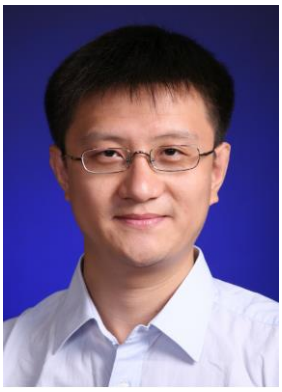
Technical Special Session 29
Design, Analysis and Control of Micro-/nano-manipulating Systems (ss)

Room 2

10:20–12:20 Thursday, 16 August

Organizer: Zhen Zhang

Co-Organizer: Peng Yan



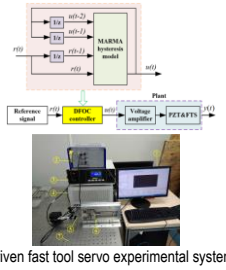
29-1 10:20–10:40

A Novel Modified Auto-regressive Moving Average Hysteresis Model

Jiedong Li, Hui Tang*, et.al

Key Laboratory of Precision Microelectronic Manufacturing Technology & Equipment of Ministry of Education, Guangdong University of Technology, Guangzhou, China.

- An novel MARMA hysteresis nonlinear model is proposed in this paper.
- A direct feedforward open-loop control (DFOC) strategy is designed based on MARMA model.
- MARMA model is nearly 20 times higher than PI model in terms of control accuracy and linearity.



PZT-driven fast tool servo experimental system

Notes

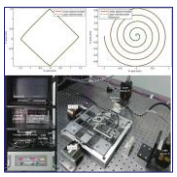
29-2 10:40–11:00

A Large Range X-Y Parallel Micro-motion System with Optical Encoder Displacement Feedback

Zhiming Zhang[1], Guangbo Hao[2] and Peng Yan[1]

1. School of Mechanical Engineering, Shandong University, China
2. School of Engineering-Electrical and Electronic Engineering, University College Cork, Ireland

- A large range X-Y parallel micro-motion system using optical encoder for displacement feedback was presented.
- An X-Y parallel micro-stage was further fabricated and assembled with optical encoder displacement feedback.
- Open-loop and preliminary closed-loop experiments were conducted, where the sensing accuracy of the proposed method was evaluated.



X-Y parallel micro-motion system

Notes

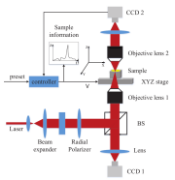
29-3 11:00–11:20

Development of a Compact XYZ Nanopositioner Supporting Optical Scanning

Yue Wang and Peng Yan

School of Mechanical Engineering, Shandong University, China

- An XYZ PZT driven nano-positioning stage supporting optical scanning was designed, optimized and fabricated.
- A hollow structure was designed in the Z-stage to ensure a light path.
- Simulation and experimental results were consistent, which demonstrated high performances on statics and dynamics.



Single axis SPR detection system

Notes

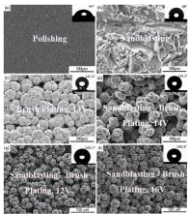
Technical Special Session 29
Design, Analysis and Control of
Micro-/nano-manipulating Systems (ss)
Room 2
10:20–12:20 Thursday, 16 August
Organizer: Peng Yan
Co-Organizer: Zhen Zhang

29-4 11:20–11:40

•The Hydrophobic Surface Prepared by Sandblasting-Electroplating on Carbon Steel

Yingluo Zhou
School of Mechanical and Electric Engineering
Changchun University of Science and Technology
Changchun P.R. China

- A sandblasting-electroplating method was used to obtain the hydrophobic properties on the carbon steel surface.
- A hydrophobic surface with a contact angle of 149.3°±2.5° was obtained.
- Sandblasting-electroplating combination method can achieve better hydrophobicity than single sandblasting or electroplating method.



SEM and contact angle images of different processed samples

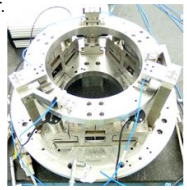
Notes

29-5 11:40–12:00

A Six-DOF Micro-/Nanopositioning System

Defu Zhang, Huanan Chen, Pengzhi Li, et al.
SKLAO, CIOMP, Chinese Academy of Sciences, Changchun, China

- A six-DOF flexure mechanism is studied in this paper.
- A lever-bipod-lever reduction mechanism has been used in limb.
- The output compliance model of the mechanism has been established.
- The resolution is better than 10nm × 10nm × 5nm × 100nrad × 100nrad × 200nrad.
- The stroke is more than 80μm × 80μm × 60μm × 400μrad × 400μrad × 600μrad.



The six-DOF Stage

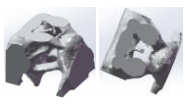
Notes

29-6 12:00–12:20

Topological Structure Synthesis of Three-Rotational-DOF Compliant Mechanisms

Zhu Dachang, Zhang Chunliang, Feng Yanping
School of Mechanical & Electric Engineering, Guangzhou University, China

- To build the accurate modeling after structural optimization, a novel topology optimization method combining the SIMP approach with the isomorphic Jacobi mapping matrix is proposed in this paper
- The topological structure of spatial compliant mechanism with three-rotational-DOF is dervied



Topological structure of spatial compliant mechanism with three-rotational-DOF

Notes

Technical Session 30
Nanoelectronics and Nanophotonics

Room 3

10:20–12:20 Thursday, 16 August

Chair: Yang Xu

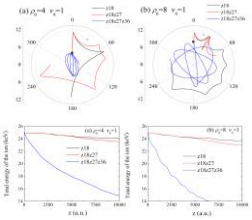
Co-Chair: Yingying Zhang

30-1 10:20–10:40

Channeling of Charged Particles in Carbon Nanotubes

Ying-Ying Zhang, Yuan-Hong Song, You-Nian Wang
School of Physics, Dalian University of Technology, China

- A semi-classical kinetic model combined with the Molecular Dynamics method
- The single-walled CNTs (SWNTs), double-walled CNTs (DWNTs) and triple-walled CNTs (TWNTs)
- The channeling trajectories of energetic charged particles(keV-MeV) in CNTs
- The total energy loss



The channeling trajectories (cross-section view) and the energy loss of moving ions in SWNTs, DWNTs and TWNTs

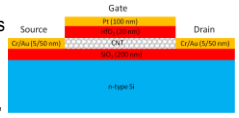
Notes

30-2 10:40–11:00

Deposition and Alignment of Carbon Nanotubes with Dielectrophoresis for Fabrication of Carbon Nanotube Field-Effect Transistors

Joevonte Kimbrough, Sam Chance, Brandon Whitaker, Zackary Duncan, Kenneth Davis, Alandria Henderson, and Zhigang Xiao
Department of Electrical Engineering, Alabama A&M University, USA
Qunying Yuan
Department of Biological and Environmental Science, Alabama A&M University, USA
Fernando Camino
Center for Functional Nanomaterials, Brookhaven National Laboratory, USA

- Deposition and alignment of carbon nanotubes using the dielectrophoresis method.
- Fabrication of carbon nanotube transistors.
- Characterization of fabricated CNT transistors, showing excellent electrical properties with high yield of functional devices.



Cross-section schematic of a carbon nanotube field-effect transistor

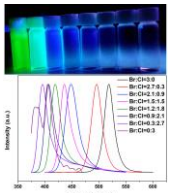
Notes

30-3 11:00–11:20

Effects of Composition on Photoluminescence Properties of Organometal Halide Perovskites Quantum Dots

Pengfei Wang, Jinhua Li, Fangjun Jin*
International Joint Research Center for Nanophotonics and Biophotonics, Changchun University of Science and Technology, Changchun

- We have synthesized organometal halide perovskites QDs with various emission wavelengths.
- The size of the QDs was adjusted by changing the composition and ratio of halogen.
- It is expected to be applied in the display industry, and improve display quality.



Optical images of QDs under UV lamp and PL emission spectra.

Notes

Technical Session 30
Nanoelectronics and Nanophotonics
Room 3
10:20–12:20 Thursday, 16 August
Chair: Yang Xu
Co-Chair: Yingying Zhang

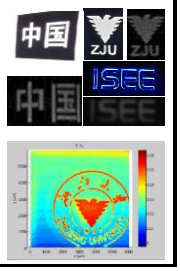
30-4 11:20–11:40

Invisible Silicon-Based Photodetection System

Yang Xu
College of Information Science and Electronic Engineering,
Zhejiang University, China

❑**Break Traditional Si-Based Photodetector Limits：**

1. Achieved: Si-Based UV VIS-Blind High-Speed Photodetector
2. Achieved: Si-Based Room Temperature Mid-IR Photodetector
3. Attempts: CMOS Circuit Integration System



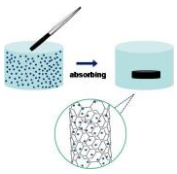
Notes

30-5 11:40–12:00

Study on Adsorpting Dyes Property of Carbon Nanotubes Reinforced Sodium Alginate Nanocomposites

Shan Ye
College of Chemical Engineering, Nanjing Forestry University, China

- Carbon nanotubes (CNTs) and sodium alginate (SA) were fabricated by a simple physical blending method.
- The achieved CNTs/SA nanocomposites were used to study the adsorption property of methylene blue.
- The adsorption property is influenced by the amount of nanocomposites, the contact time and pH.
- These nanocomposites reported here could effectively purify the waste water.



CNTs/SA nanocomposites purify the waste water

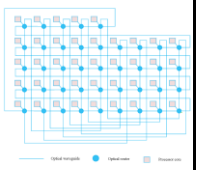
Notes

30-6 Poster1

Crosstalk Analysis and Optimization of Gaussian Networks-on-Chip

Yingxue Du
The School of Electronic and Information Engineering, Southwest University, Chongqing，China
Yiyuan Xie
The School of Electronic and Information Engineering, Southwest University, Chongqing，China

- The Gaussian-based ONoCs worst-case crosstalk noise and SNR analysis model is proposed.
- Worst-cast crosstalk noise and network performance are measured in both calculation and simulation.
- An optimization method has been proposed to improve network performance and effectively avoid the worst case.



Gaussian optical network

Notes

Technical Session 30
Nanoelectronics and Nanophotonics
Room 3
10:20–12:20 Thursday, 16 August
Chair: Yang Xu
Co-Chair: Yingying Zhang

30-7 Poster2

Exploring Plasmonic Logic Gates Based on PIT Effect

Yun Wang
The School of electronic and information engineering,
Southwest University, Chongqing, China
Yiyuan Xie
The School of electronic and information engineering,
Southwest University, Chongqing, China

- PIT can be manipulated simply through regulating the rotation angle of ellipse.
- four logic functions: AND, NAND, NOR and NOT can be achieved based on PIT.
- AND, NAND,and NOR can be operated simultaneously.
- Logic gates have higher output contrast ratios between the logic states '0' and '1' .

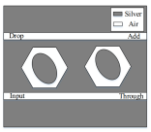


diagram of a logic device

Notes

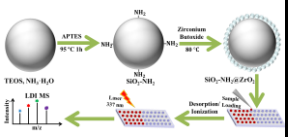
Technical Session 31
Biological Applications
Room 4
10:20–12:20 Thursday, 16 August
Chair: Jin Zhang
Co-Chair: Md Sohel Rana

31-1 10:20–10:40

Hybrid core-shell particles for metabolite detection by laser desorption/ionization mass spectrometry

Md Sohel Rana, Chandrababu Rejeeth, Vadanasundari Vedarethinam, Lin Huang, Ru Zhang Deepanjali D. Gurav*, and Kun Qian*
CBD group, School of Biomedical Engineering, Shanghai Jiao Tong University

- Hybrid core-shell particles for LDI MS assisted metabolite detection.
- Efficient entrapment of analyte molecules upon laser irradiation.
- High accuracy & sensitivity with ~nanomolar detection limits.
- A sensitive and accurate biomarker detection approach for disease diagnostics.



Scheme 1. Schematic illustration of SiO_2-NH_2@MO_2 particles for LDI MS.

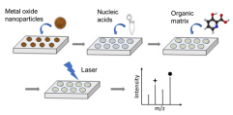
Notes

31-2 10:40–11:00

Nanoparticles as Co-matrix for Sensitive Detection of Nucleic Acids by Mass Spectrometry

Xiaomeng Hu[1,2], Lin Huang[2], Lin Wang[1], Ru Zhang[2], Qiaomei Guo[1], Kun Qian[2]*, Jiatao Lou[1]*
1 Department of Laboratory Medicine, Shanghai Chest Hospital, Shanghai Jiao Tong University
2 School of Biomedical Engineering and Med-X Research Institute, Shanghai Jiao Tong University

- A novel approach for enhancement of nucleic acids detection by LDI MS.
- Used metal oxide nanoparticles as co-matrix.
- High sensitivity and reproducibility.



Schematic illustrations of LDI MS analysis of oligonucleotides as demonstrated in our approach

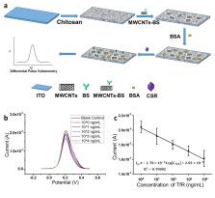
Notes

31-3 11:00–11:20

A Label-Free Electrochemical Biosensor Based on Ligand-Receptor Interaction

Xiyuan Liu
Med-X Institute, Shanghai Jiao Tong University, China

- A label-free electrochemical biosensor for detection of cell surface receptor based on ligand-receptor interaction
- Layer-by-layer (LBL) method using chitosan (Chi) and bioactive substance conjugated multi-walled carbon nanotubes (MWCNTs-BS)
- This approach can achieve an effective and sensitive detection of cell surface receptor (CSR).
- A wide linear detection range from 1 ng/mL to 10,000 ng/mL, with the LOD of 0.106 ng/mL



Fabrication of the Chi/MWCNTs-BS biosensor and electrochemical detection of CSR

Notes

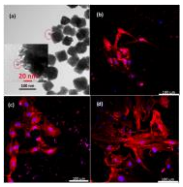
Technical Session 31
Biological Applications
Room 4
10:20–12:20 Thursday, 16 August
Chair: Jin Zhang
Co-Chair: Md Sohel Rana

31-4 11:20–11:40

Biocompatible Protein (IgG) Modified up-conversion Nanoparticles (NaGdF4: Yb3+, Er3+) deposited by Matrix Assisted Pulsed Laser Evaporation (MAPLE)

Jin Zhang
Department of Chemical and Biochemical Engineering, University of Western Ontario, London, Ontario, Canada N6A 5B9

- MAPLE technique, a contamination-free process, is used to deposit UCNPs and IgG conjugated UCNPs (UCNPs-IgG) on the bottom of cell culture dish. Human umbilical vein endothelial cells (HUVECs) cultured on the surface treated with UCNPs and UCNPs-IgG show increased cell area, cell length, and the length of connection which are very important to support the ideal confluence and the formation of micro-vessel structures. MAPLE deposited UCNPs and UCNPs-IgG samples have good biocompatibility and show no toxic effect to the HUVECs. It is expected that MAPLE deposition of UCNPs and UCNPs-IgG could be applied in the fabrication of the new biological devices for tissue engineering and tissue regeneration.



(a) TEM micrograph of IgG modified UCNPs, and HUVECs on the surface of (b) control, (c) UCNPs, (d) IgG modified UCNPs.

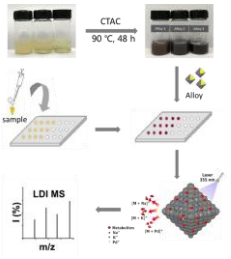
Notes

31-5 11:40–12:00

Size-selected core-shell nanoalloys for laser desorption/ionization detection of small metabolites

Jing Cao
School of Biomedical Engineering, Shanghai Jiao Tong University, China

- Sensitive and high throughput detection of small metabolites in human biofluid plays an important role in the diagnosis of diseases. Here we report a one-step synthesis of a kind of core-shell nanoalloy with tunable structures for LDI MS detection of small metabolites. The optimized nanoalloy could detect small molecules in 1.0 microliter biofluid with direct laser desorption/ionization mass spectrometry.



Schematic diagram of core-shell alloys synthesis and its application in LDI MS.

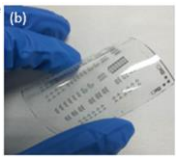
Notes

31-6 12:00–12:20

A full-swing inverter based on IGZO TFTs for flexible circuits

Jiwen Zheng, Zhaogui Wang, Changdong Chen, Minmin Li, Chuan Liu*
State Key Lab of Opto-Electronic Materials & Technologies, Sun Yat-Sen University, Guangdong China

- IGZO TFTs are fabricated on the PET substrate at the temperature of 180℃.
- The mobility and on-off ration are up to 8 $cm^2V^{-1}s^{-1}$ and 10^5 respectively.
- An inverter based on IGZO TFTs has been achieved on the PET substrate with a gain reaching -20.
- In conclusion, our work has investigated flexible devices including IGZO TFTs and full-swing inverters on PET substrate.



picture of the flexible TFTs fabricated on PET substrate.

Notes

Technical Session 32
Nanofabrication and Nanocharacterization

Room 5

10:20–12:20 Thursday, 16 August

Chair: Behrooz Mirza

Co-Chair: Stefan Schlosser

32-1 10:20–10:40

Development and Experiment of A Novel Vibration- assisted Cutting Apparatus

Wanfei Ren

National and Local Joint Engineering Laboratory for Precision Manufacturing and Detection Technology, Changchun university of science and technology, China

- In present paper, a mechanical model of vibration-assisted cutting apparatus was designed and than evaluated by off-line test analysis.
- The novel apparatus can work at below 124 Hz with maximum stroke 27.285μm.
- Fuzzy PID was preliminary introduced into vibration-assisted cutting apparatus control strategy.

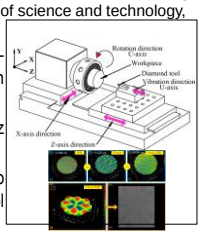


Fig 1. Working principle diagram of the apparatus and cutting experiment

Notes

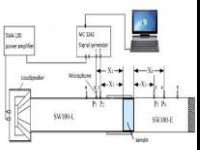
32-2 10:40–11:00

Experimental Optimization of Acoustic Properties of Polyurethane Foam

Zheming Liu

National and Local Joint Engineering Laboratory for Precision Manufacturing and Detection Technology, Changchun University of Science and Technology, China

- The acoustic properties of the polyurethane foam were measured by impedance tube.
- Using sound absorption coefficient as the index, three factors were analyzed by experimental optimization design.
- The ratio of polyols to MDI is the strongest factor affecting the sound absorption coefficient



Equipment and principle

Notes

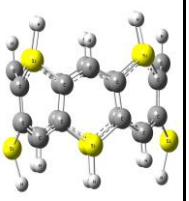
32-3 11:00–11:20

A Theoretical Study of Si Impacts on Novel Silicon-Carbon Cyclacenes

Behrooz Mirza[a*], Somayeh Soleimani-Amiri[a], Maziar Mirza[a]

Department of Chemistry, Karaj branch, Islamic Azad University

- Singlet and triplet states of $[6]_n$ SiC-cyclacenes (n =6, 8, 10, and 12) are compared and contrasted at DFT.
- Triplet ground state found for $[6]_n$ SiC-cyclacene (n= 6, 8, 10, 12).
- The strain energy of $[6]_n$ SiC-cyclacrenes are studied through homodesmic equations.



$[6]_n$ SiC-cyclacenes (n =6, 8, 10, and 12)

Notes

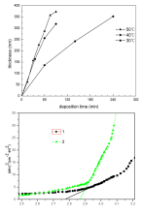
Technical Session 32
Nanofabrication and Nanocharacterization
Room 5
10:20–12:20 Thursday, 16 August
Chair: Behrooz Mirza
Co-Chair: Stefan Schlosser

32-4 11:20–11:40

Growth and optical properties of ZnSe nanofilms obtained from modified Ammonia-free chemical bath solution

Liangyan Chen
School of Electrical and Electronic Engineering, Wuhan polytechnic University, China

- Ammonia was eliminated from the complexing agents
- Films deposited were uniform, transparent and in good stiochiometric ratio
- Be meaningful to the fabrication of ZnSe thin films in the industrial production



Growth and optical properties

Notes

32-5 11:40–12:00

Suspensions of Graphene Oxide Nanoparticles in Ionic Liquids

Rebecca Henderson
Dept. Chem. Process Engineering, University of Strathclyde, United Kingdom
Ján Marták, Marek Blahušiak, Stefan Schlosser
Dept. Chem. Biochem. Engineering, Slovak Uniersity of Technology , Slovakia

- Direct dispergation of lyophilised graphene oxide (GO) nanoparticles and hydrophobized magnetic iron oxide nanoparticles into two phosphonium ionic liquids (ILs) with phosphinate and carboxylate anions to get stable suspension was not possible.
- A new method of GO surface modification proved successful.
- An acceptable stability of modified GO suspensions in the binary solvents of both ILs with dodecane was achieved.
- Further improvement of suspension stability would be welcome.

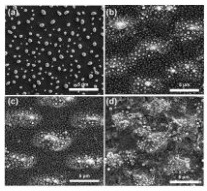
Notes

32-6 11:20–11:40

Dewetting of Ni Thin Films and Formation of Ni Nanoparticle Arrays on Laser-interference Patterned Substrates

Lu Wang[1], Litong Dong[1], Li Li[1], Zhankun Weng[1], and Zuobin Wang[1,2]
1. JR3CN&CNM, CUST, China
2. JR3CN&IRAC, University of Bedfordshire, UK

- This paper reports a method for fabricating two-dimensional (2D) ordered arrays of metal nanoparticles over a large area.
- A simple two-step process combining laser interference patterning (LIP) and thermal dewetting was developed.
- 2D arrays of Ni nanoparticles with uniform sizes and narrow interparticle distances were fabricated on laser-interference patterned silicon substrates.



SEM images of the Ni NPs formed on silicon substrates by dewetting Ni films.

Notes

Technical Session 32
Nanofabrication and Nanocharacterization
Room 5
10:20–12:20 Thursday, 16 August
Chair: Behrooz Mirza
Co-Chair: Stefan Schlosser

32-7 Poster1

A full-swing inverter based on IGZO TFTs for flexible circuits

Jiwen Zheng, Zhaogui Wang, Changdong Chen, Minmin Li, Chuan Liu*
State Key Lab of Opto-Electronic Materials & Technologies, Sun Yat-Sen University, Guangdong China

- IGZO TFTs are fabricated on the PET substrate at the temperature of 180℃.
- The mobility and on-off ration are up to 8 $cm^2V^{-1}s^{-1}$ and 10^5 respectively.
- An inverter based on IGZO TFTs has been achieved on the PET substrate with a gain reaching -20.
- In conclusion, our work has investigated flexible devices including IGZO TFTs and full-swing inverters on PET substrate.

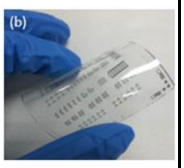


Figure. A picture of the flexible TFTs fabricated on PET substrate.

Notes

Technical Special Session 33
2D Materials at Nanoscale: from Fundamentals to Applications (ss)

Room 6

10:20–12:20 Thursday, 16 August

Organizer: Aslan Hüsnü

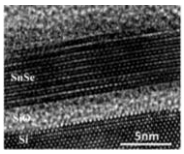
Co-Organizer: Zegao Wang

33-1 10:20–10:40

Van der Waals SnSe/Si Heterostructure for High-Performance Photodetector and Sensor

Lanzhong Hao
College of Materials Science and Technology, China University Petroleum (East China), China

- VdWs growth of wafer-scaled SnSe film on Si was realized by magnetron sputtering method.
- The SnSe/Si heterostructure exhibited excellent photosensing performance with high detectivity and fast response speed.
- Pronounced H_2 sensing characteristics with ultrahigh sensitivity were obtained through metal Pd surface decoration.



Notes

33-2 10:40–11:00

Transition metal chalcogenide based nanomaterials as highly efficient electrocatalysts for water splitting

Yuanfu Chen
State Key Laboratory of Electronic Thin Films and Integrated Devices, University of Electronic Science and Technology of China, China

- Electrocatalysts can significantly reduce the energy consumption during the progress of the water splitting.
- In this talk, we will focus on the transition metal dichalcogenides and their composites as nonprecious electrocatalysts for water splitting.
- We will present the controllable synthesis of transition metal dichalcogenides and their composites; then the morphology, microstructure and crystalline structure were investigated
- The water splitting performance and corresponding mechanism were investigated.

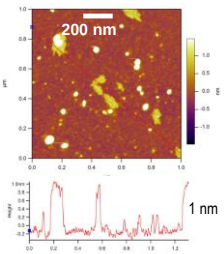
Notes

33-3 11:00–11:20

Single sheet iron oxide: synthesis, structure and environmental catalysis

Li-Zhi Huang
School of Civil Engineering, Wuhan University, China

- Single sheet iron oxide (SSI) with the thickness of 1 nm was successfully synthesized.
- SSI films were fabricated on ITO electrode *via* layer-by-layer electrostatic assembly.
- SSI electrode catalyze the electrochemical reduction of nitroaromatic compounds.
- SSI electrode can generate reactive oxygen species for organic pollutant removal.



AFM of single sheet iron oxide

Notes

Technical Special Session 33
2D Materials at Nanoscale: from Fundamentals to Applications (ss)

Room 6

10:20–12:20 Thursday, 16 August

Organizer: Zegao Wang

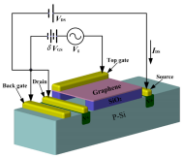
Co-Organizer: Aslan Hüsnü

33-4 11:20–11:40

Research on the 2D Material Field-effect Transistors with MEMS-CMOS Technique

Quan Wang
Institute of Semiconductor Transducer Technology, Jiangsu University, P.R.China

- We fabricated and characterized FETs containing a suspended or supported monolayer of MoS_2. Marked differences between the electrical performance of the two device architectures were observed.
- The graphene-contacted MoS_2-FETs exhibit superior performances and the nearly Ohmic contacts
- We demonstrate a suspended black phosphorus field effect transistor (BP-FET) and utilize Raman spectroscope to characterize the strain on the effects of Raman phonon.



Devices of two-dimensional Materials

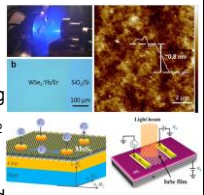
Notes

33-5 11:40–12:00

Wafer-scale 2D Layered Materials Prepared by Pulse Laser Deposition

Wenjing Jie
College of Chemistry and Materials Science, Sichuan Normal University, China

- Pulse laser deposition (PLD) method was used to grow 2D Yb/Er co-doped WSe_2, MoS_2 and InSe
- Wide modulation in the luminescence of 2D layered WSe_2 was achieved by using lanthanide ions doping
- Room temperature MR was observed through MoS_2 /ferromagnetic heterostructure
- Wafer-scale high-quality 2D layered ultra thin InSe layers with widely tunable band gap showed a broad photoresponse



PLD-grownYb/Er doped WSe_2, MoS_2/CFO heterostructure and wafer-scale InSe

Notes

Technical Session 34
Nanosensing and Microscopy
Room 7
10:20–12:20 Thursday, 16 August
Chair: Yanjun Li
Co-Chair: Denghua Li

34-1 10:20–10:40

Research on Physical Parameter Measurement System of Fiber Fabry-Perot Interferometer

Yanjun Li, Wenqi Wu
College of Electrical Engineering, Henan University of Technology, Zhengzhou, Henan, 450001, China

Bullet points

- The Fabry-Perot interferometer produces multi-beam interference based on two parallel plates.
- the length of the Fabry-Perot cavity and the adjacent peak of the interference fringe have a linear inverse relationship.
- This method is sufficient to calculate the fine pitch of the Faber cavity length.

contribution

By using the principle of multi-beam interference, two well cleaved optical fibers are used to fabricate the fiber Fabry-Perot interference cavity, and the interference spectrum is used to analyze the physical parameters. This fiber Fabry-Perot interferometer can be applied to the measurement of the length, displacement, and has a wide range of measurement applications due to its stability and durability.

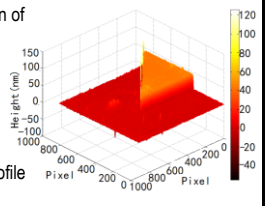
Notes

34-2 10:40–11:00

Optimazation of Phase Noise in Digital Holographic Microscopy

Yanan Zeng, Junsheng Lu
College of Engineering and Technology, Tianjin Agricultural University, China
State Key Laboratory of Precision Measuring Technology and Instruments, Tianjin University, China

- Propose an optimized method of digital microscopic hologram with the combination of DHM and BEMD
- Enhance interference information in digital microscopic hologram
- Reduce recorded noises of both high frequency and low frequency
- Improve signal-to-noise ratio of surface profile measurement of microstructures or nanostructures



Notes

34-3 11:00–11:20

Image Analysis with DMD in Convergent Path

Yongqiang Sun
Key Laboratory of Opto-electronic Measurement and Optical Information Transmission Technology · Ministry of Education
Changchun University of Science and Technology , China

- Analysis and calculate the OPD caused by the DMD
- Propose the method of evaluating and compensating the OPD caused by the DMD
- Provide reference for the design and adjustment of optical path using the DMD

Notes

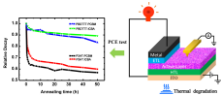
Technical Session 34
Nanosensing and Microscopy
Room 7
10:20–12:20 Thursday, 16 August
Chair: Yanjun Li
Co-Chair: Denghua Li

34-4 11:20–11:40

Thermal Stability of Bulk Heterojunction Photovoltaics Revealed by Electrical Scanning Probe Microscopy

Denghua Li
Agricultural Information Institute of Chinese Academy of Agricultural Sciences; National Center for Nanoscience and Technology, China

- The thermal stability and degradation behavior of bulk heterojunction solar cells were studied.
- Internal phase heterogeneity and local charge transport were probed.
- Physical evolution processes were proposed to depict the thermal aging effects within the active layer.
- The work provides new insights into making thermally stable photovoltaics by considering mesoscopic heterogeneity.



Consistency between the in situ mesoscopic properties and the macroscopic device performances were revealed

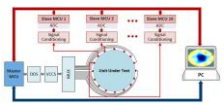
Notes

34-5 11:40–12:00

A Parallel Impedance Measurement System for Electrical Impedance Tomography System with Multi-Microcontroller-Unit Architecture

Qilong Deng
School of Electronics and Information, Yangtze University, China

- Highly integrated with multi-processor architecture.
- Balance between hardware cost and frame rate.
- Portable size and low cost.
- Parallel impedance measurement.



EIT system block diagram

Notes

General Information

Hangzhou, a fascinating city

Hangzhou, the provincial capital of Zhejiang Province, a Deputy Center City of Yangtze River Delta area, one of the central cities of East China area, financial center of southern Yangtze River Delta area, the political, economical, cultural, technological, transportation, media and financial center of Zhejiang Province.

Hangzhou, located at the north of Zhejiang Province, Downstream of the Qiantang River, south to the Grand River, one of the Chinese Best Traveling Destinations by National Traveling Bureau, famed as "Heaven on Earth"since ancient times.

Climate

Hangzhou enjoys a subtropical, monsoon climate with four distinct seasons. The weather is changeable and generally warm, humid and rainy. The average relative humidity between 74% and 85%.

Architecture

Located in Jiangnan areas, Hangzhou, as one the seven capitals of ancient China and the center of politics, culture and economy of Zhejiang Province, still retains many traditional Jiangnan residences.

There are many famous attraction such as Lingyin Temple, Pagoda of Six Harmonies, Peak Flying from Afar, Yue Fei Mausoleum, Xiling Seal Engravers' Society, Longjing Tea Plantation and so on.

Culture

Hangzhou, as a history laden city, is one of the seven ancient capitals of China. In Hangzhou, temples, pagodas, poems, proses, paintings, music and calligraphy are all inextricably woven into a kaleidoscope of cultural tradition and philosophical aesthetics.

Contact Information

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Address:

Main Building, Room 204

International Research Center for Nano Handling and Manufacturing of China,

Changchun University of Science and Technology

7089 Weixing Road, Chaoyang District, Changchun, China, 130022

Conference Venue

All sessions will be held at Four Points By Sheraton Hangzhou, Binjiang

Address:

868 Dongxin Avenue, Binjiang District, Hangzhou, Zhejiang

Phone: 0571-28878888

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Electricity

The electric current used in China is 220V 50Hz. The hotels can provide 220V power outlets. Please note that plug adapters may be necessary.

Dialing Codes

China International Country Code: +86

Hangzhou's Local Area Code: 0571

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