Conference Program

Digest

The 6th International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale

IEEE 3M-NANO 2016

Chongqing, China

18 – 22 July 2016

Organized by:

IEEE Nanotechnology Council

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences

Changchun University of Science and Technology, China

International Society for Nano Manipulation, Manufacturing and Measurement

Tampere University of Technology, Finland

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Research Executive Agency (REA), European Commission

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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 Chongqing at IEEE 3M-NANO 2016 conference!

3M-NANO is an annual International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, held for the sixth time in Chongqing. 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 2016 is proud to offer an excellent technical program containing 18 keynote talks on major conference topics delivered by distinguished researchers and around 130 presentations in parallel technical program.

Jiahu Yuan

3M-NANO 2016, Honorary Chair

Hongliang Cui

3M-NANO 2016, General Chair

A major goal of the 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 2016 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 2016. Last but definitely not least, we thank all the conference participants for their support and contribution. We do hope that IEEE 3M-NANO 2016 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 Chongqing!

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Conference Information

Venue and Accommodation

Venue

Grand Metropark Hotel Chongqing is an international 5-star luxury hotel converging with food, rooms, entertainment, fitness and conference centre. The hotel is located in the economic centre of Chongqing,surrounded by many large enterprises and the best business communication atmosphere in Chongqing.

Address: Conference Center
1598 Jinkai Road, North New Zone, Yubei District, 401160 Chongqing, P. R. China

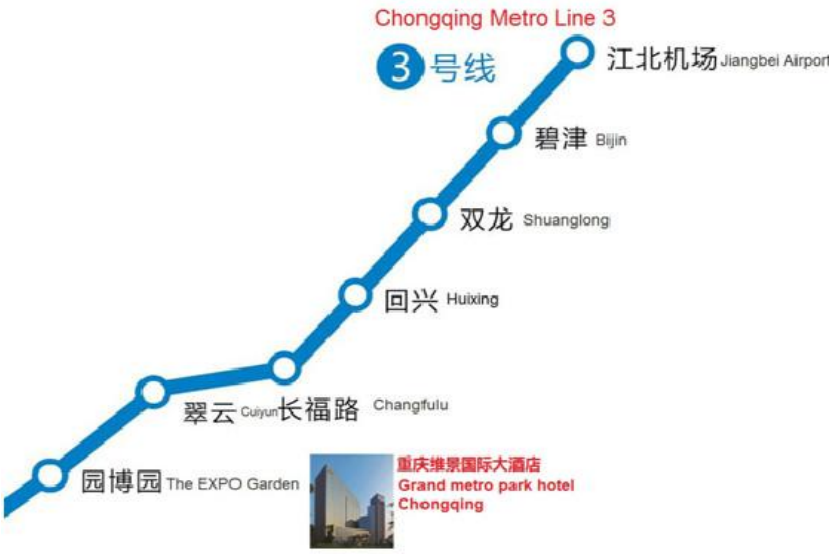
Phone: +86 18996067771

E-mail: 271996174@qq.com

Accommodation

The accommodation of 3M-NANO 2016 is arranged in the Grand Metropark Hotel Chongqing.

If you arrive at Chongqing by air:



Airport enquiries Tel: +86 23 67156103

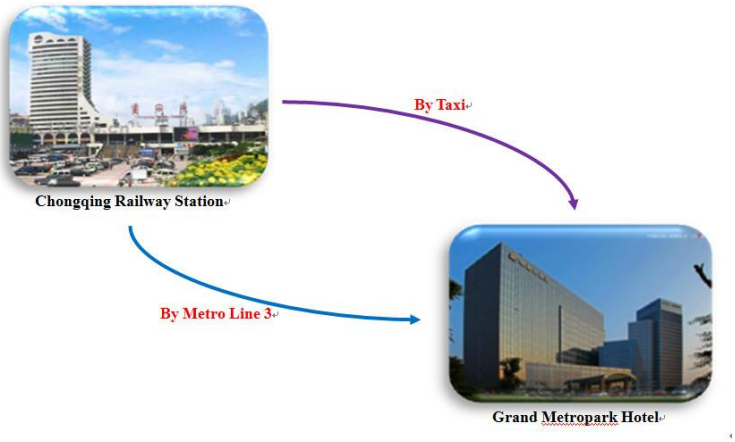
Metro: take Line 3 at "Jiangbei Airport" station and get off at "The EXPO Garden" station;

Taxi: take a taxi to Grand Metropark Hotel Chongqing (RMB 30).

If you arrive at Chongqing by train:

You will arrive in Chongqing at one of the following destinations:

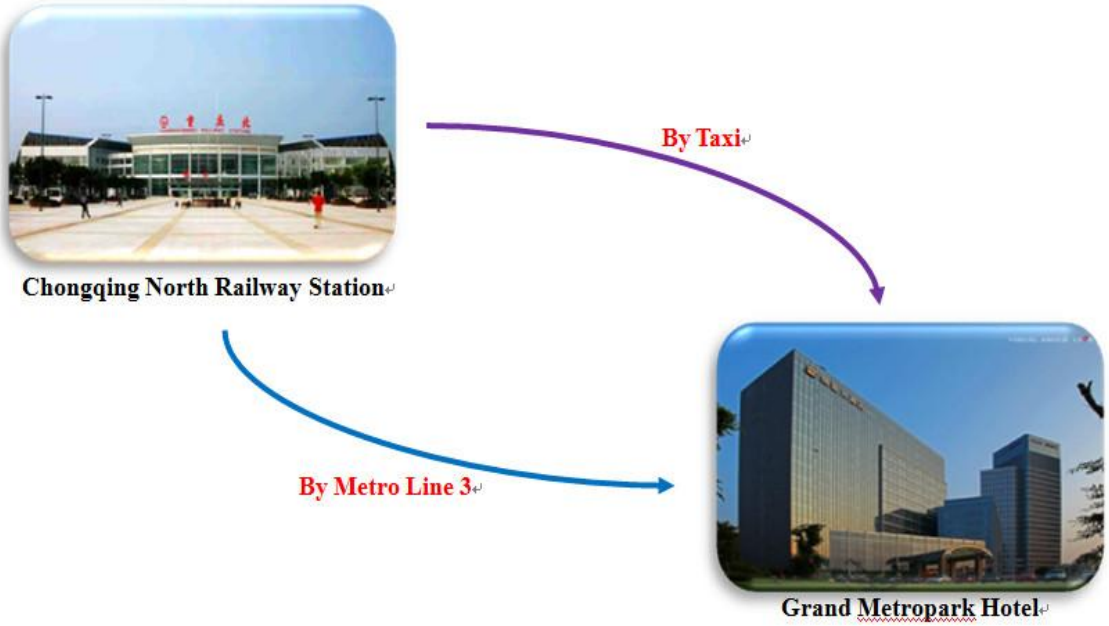
Chongqing Railway Station



Taxi: take a taxi to Grand Metropark Hotel (18km, around RMB 40)

Metro: take Line 3 at "Lianglukou" station and get off at "The EXPO Garden" station. Grand Metropark Hotel is very close to this station.

Chongqing North Railway Station

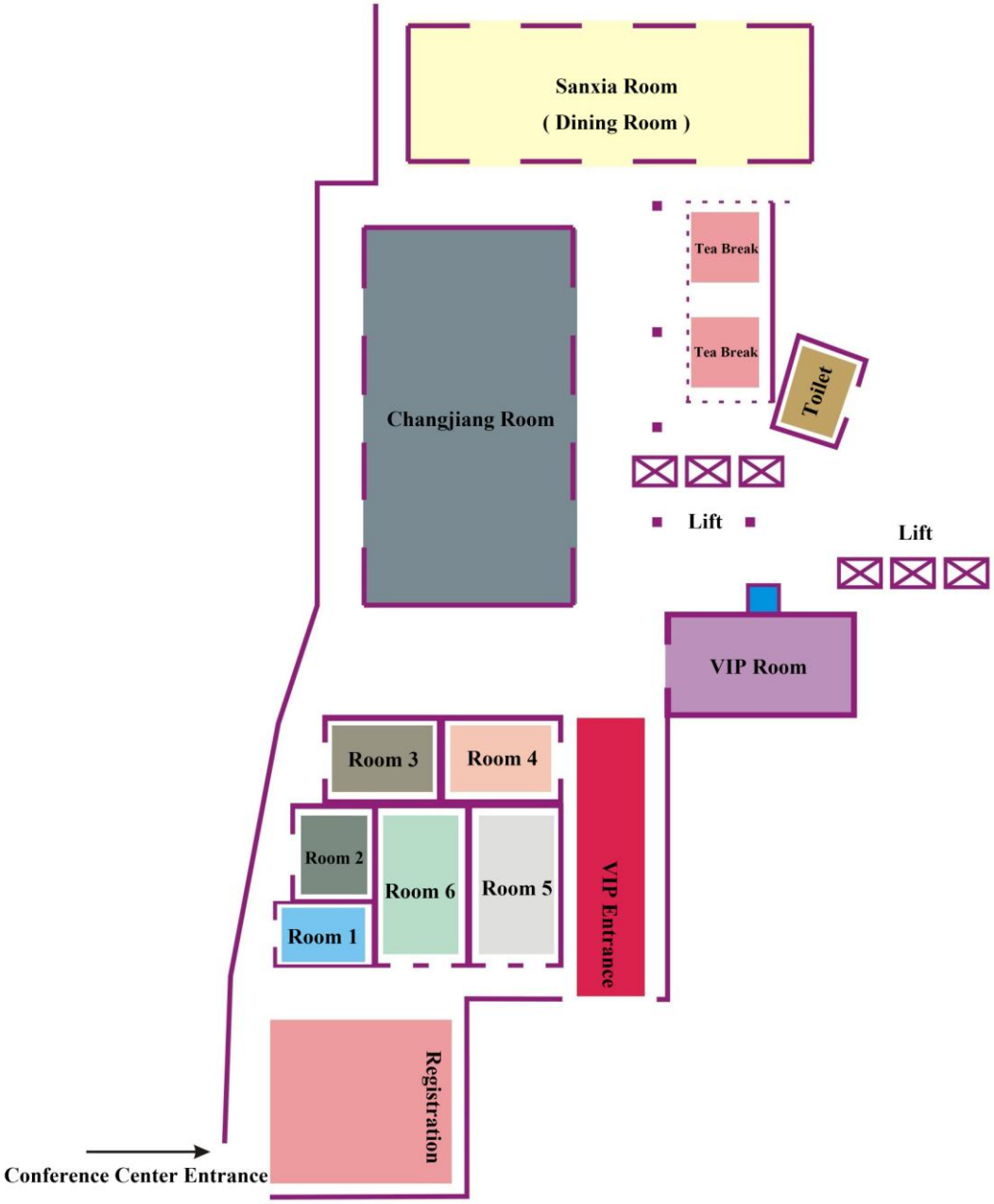


Taxi: take a taxi to Grand Metropark Hotel (10km, around RMB 25)

Metro: take Line 3 at “Chongqingbei” station and get off at “The EXPO Garden” station. Grand Metropark Hotel is very close to this station.

Floor Maps of Conference Rooms

Conference Center, -1F



Conference registration will be arranged on the following days:

18 July, 13:00 – 18:00 **Grand Metropark Hotel, 1F**

19 - 21 July, 09:00 – 17:00 **Grand Metropark Hotel, Conference Center, -1F**

IEEE 3M-NANO 2016

Program at a Glance

Monday, 18 July, 13:00-18:00, Grand Metropark Hotel, 1F	
Registration	
Tuesday, 19 July, 8:00-11:20, Changjiang Room, -1F	
08:00—08:20	Opening ceremony
08:20—09:40	Keynote reports
09:40—10:00	Break
10:00—11:20	Keynote reports
11:20—13:30	Lunch
Tuesday, 19 July, 13:30-17:50, Rooms 1-6, -1F	
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
Wednesday, 20 July, 8:00-17:00, Changjiang Room, -1F	
08:00—10:00	Keynote reports
10:00—10:20	Break
10:20—12:20	Keynote reports

12:20—14:00	Lunch
14:00—15:20	Keynote reports
15:20—15:40	Break
15:40—17:00	Keynote reports
17:00—20:00	Conference dinner
Thursday, 21 July, 8:00-12:20, Rooms 1-6, -1F	
08:00—10:00	Parallel technical sessions
10:00—10:20	Break
10:20—12:20	Parallel technical sessions
12:20—14:00	Lunch
Thursday, 21 July, 14:00-18:00, Changjiang Room, -1F	
14:00—15:20	Keynote reports
15:20—15:40	Break
15:40—17:00	Keynote reports
17:00—18:00	Closing ceremony
18:00—20:00	Farewell banquet
Friday, 22 July, 9:00-16:30	
Social culture activities	

Schedule of the Keynote Reports

Tuesday, 19 July 2016, Changjiang Room, -1F

Time	Topic	Speaker
Session Chair: Hongliang Cui		
08:20 – 09:00	Novel Photonic Devices for Lighting and Communication Applications	Nigel Copner
09:00 – 09:40	Measurement and Characterisation of Surface Properties at Micro-Nano Scales	Xianping Liu
Session Chair: Nigel Copner		
10:00 – 10:40	Magnetic and Magnetoelectric Small-scale Machines	Salvador Pané i Vidal
10:40 – 11:20	Nanopore Sequencing of Biomacromolecules	Aksimentiev Oleksii

Wednesday, 20 July 2016, Changjiang Room, -1F

Time	Topic	Speaker
Session Chair: Xianping Liu		
08:00 – 08:40	3D Nano Printing	Min Gu
08:40 – 09:20	Terahertz Technology for Test & Measurement	Thomas W. Crowe
09:20 – 10:00	Graphene Oxide-a Versatile Platform for 2D Optoelectronic Devices	Baohua Jia
Session Chair: Thomas W. Crowe		

10:20 – 11:00	Study of Carrier Dynamics in Au-TiO_2 Nanoparticle System for Solar Cell and Photocatalyst by Using PEEM and Femtosecond Laser	Toshihisa Tomie
11:00 – 11:40	Carbon Based Electronics and Electromechanics	Sang Wook Lee
11:40 – 12:20	Scalable Nanopatterning Technologies and Applications in Photonics	L. Jay Guo
Session Chair: Mingdong Dong		
14:00 – 14:40	Ultra-precision Machining of Micro/Nanostructures and Its Application	Sandy To
14:40 – 15:20	Graphene Film Mass Production and Applications in Chongqing	Haofei Shi
Session Chair: Sandy To		
15:40– 16:20	Single Molecule Investigations on DNA Origami Platform	Mingdong Dong
16:20 – 17:00	Visual Servoing of Robots in Uncalibrated Environments	Hesheng Wang

Thursday, 21 July 2016, Changjiang Room, -1F

Time	Topic	Speaker
Session Chair: Santiago M Olaizola		
14:00 – 14:40	3D Battery	Wilhelm Pfleging
14:40 – 15:20	Functionalization and Assembly of Nanomaterials for Electrochemical Energy Storage and Solar Energy Conversion	Yuegang Zhang
Session Chair: Wilhelm Pfleging		
15:40 – 16:20	The Art of Precision Laser Processing of Surface Materials	Santiago M Olaizola
16:20 – 17:00	Terahertz Spectroscopic Detection of Biomolecules	Hongliang Cui

Keynote Speakers

(in alphabetical order)

Novel Photonic Devices for Lighting and Communication Applications

Nigel Copner

Professor
Head of Wireless and Optoelectronics Research and Innovation Centre (WORIC)
Faculty of Computing, Engineering and Science
University of South Wales, UK
E-mail: nigel.copner@southwales.ac.uk

Abstract: Photonic devices possess the capability to source, detect, and control light, which makes it ideal to be used in the wide range of applications such as for indoor and outdoor lighting, mobile phones in the field of consumer electronics, for fiber optics in telecommunication, for bio-sensors in life science, for measurement in aerospace & defense. Research of novel photonic devices/systems for high efficiency LED/OLED lighting and ultrafast communication applications in Wireless and Optoelectronics Research and Innovation Centre (WORIC) will be introduced in this presentation.

Terahertz Technology for Test & Measurement

Thomas W. Crowe

Visiting Research Professor
Founder and CEO
Virginia Diodes, Inc.
Department of ECE
University of Virginia, USA
E-mail: twc8u@virginia.edu

Abstract: The terahertz frequency range spans the technological gap between microwave electronics and infrared photonics, and represents unique challenges ~~fo~~r scientists and engineers. This talk will review the state of terahertz technology and its use for science applications, including the measurement and evaluation of new materials. The emphasis will be on the capabilities of terahertz sources and detectors, including reviews of the most important applications.

Terahertz Spectroscopic Detection of Biomolecules

Hongliang Cui

Professor
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences
School of Instrumentation Science and Electrical Engineering
Jilin University, China
E-mail: hcui@cigit.ax.cn

Abstract: Terahertz (THz) electromagnetic wave belonging to the frequency band from 0.1 to 10 THz (pundits narrow this range to 0.3 - 3 THz) has emerged as a powerful tool for investigating biomolecular systems. Since the energy level of THz wave largely coincides with that of the biomolecular low-frequency motions including vibration, rotation and translation of the molecular skeleton and that of the weak intermolecular interactions including hydrogen-bond and van der Waals interaction, THz spectroscopy as a molecular detection technology has its unique advantages over some other existing ones. At the same time, due to the picosecond timescales of the conformational change and the solvation dynamics of most biomacromolecules such as protein and DNA, THz spectroscopy can be well suited to explore the dynamics of biomolecules in aqueous solution.

In the last several years, our research group has focused on THz spectroscopy detection and spectral imaging of biomolecules, especially on the development of a THz near-field nanoscopy equipment for imaging of cells and real-time investigation of the interaction between proteins with biomedical significance. On the theoretical front, we have calculated and analyzed the characteristic spectra of polypeptides, proteins, and DNA polynucleotides, and investigated the effects of concentration, conformation and size of biomolecules on their THz spectra. Experimentally, simple and efficient liquid sample cells and micro/nanofluidic channels for THz spectroscopy tests were fabricated and the THz spectra of DNA, protein, lipid, bacteria, and cells were investigated. Details of these studies, progresses and outlooks will be presented.

Single Molecule Investigations on DNA Origami Platform

Mingdong Dong

Associate Professor
Head, Bio-SPM Lab
Interdisciplinary Nanoscience Center (iNANO)
Aarhus University, Denmark
E-mail: dong@inano.au.dk

Abstract: DNA nanotechnology provides a robust method for building nanoscale architectures. The programmable surfaces of 2D DNA origami provide an idea functional template to control the spatial orientation of individual molecules in accurate position. Such programmable DNA surfaces can be utilized for investigating biological molecules at single molecule level.

3D Nano Printing

Min Gu

Distinguished Professor
Artificial Intelligence Photonics Laboratory
School of Sciences
Royal Melbourne Institute of Technology University (RMIT)
Australia
E-mail: min.gu@rmit.edu.au

Abstract: In this talk, I will introduce the concept of 3D nano printing which was achieved by our invention of super-resolution photoinduction-inhibition nanolithography, enabling to break the diffraction barrier that has governed the optical instruments for over 140 years. More importantly, by combining our invention of multifocal microscopy, we have demonstrated optical fabrication with great resolution comparable to E-beam lithography but with three-dimensional capability and unprecedented throughput. This technique opens new pathway to produce functional 3D nano structures.

Scalable Nanopatterning Technologies and Applications in Photonics

L. Jay Guo

Professor
Department of Electrical Engineering and Computer Science
The University of Michigan
USA
E-mail: guo@umich.edu

Abstract: There is increasing interest and demand for nanomanufacturing technologies that are scalable both in spatial dimension (i.e. large areas) and in time (high speed). For example, to address the growing market and applications in display, photovoltaic and biological applications, cost effective, high precision, large area patterning technologies are in high demand. To overcome the resolution limited by light diffraction in photolithography, mechanical based methods (e.g. Nanoimprint Lithography) were developed, and has been scaled up to continuous roll to roll patterning. There is also renewed interest in photolithography due to its high throughput by exploring plasmonics. Recent results show that uniform, deep-subwavelength, and high aspect ratio structures can be obtained by exploiting spatial light filtering. Applications in structural colors and metasurfaces will be discussed.

Graphene Oxide-a Versatile Platform for 2D Optoelectronic Devices

Baohua Jia

Associate Professor
Centre for Micro-Photonics, Faculty of Science, Engineering and Technology
Swinburne University of Technology
Melbourne, Australia
E-mail: bjia@swin.edu.au

Abstract: Recently, inspired by the extraordinary physical and chemical properties of graphene, great research effort has been devoted to develop functional graphene-enabled devices. However, challenges still exist in developing scalable and low-cost fabrication method. Solution processible graphene oxide provides a viable approach for achieving reasonable quality and large-scale graphene films with minimum fabrication effort through removing the oxygen containing groups in graphene oxide. In this talk I will introduce our recent progress on laser patterned graphene oxide film for highly-integrated optoelectronics devices towards energy, information technology and aerospace applications.

Carbon Based Electronics and Electromechanics

Sang Wook Lee

Professor
School of Physics
Konkuk University
Seoul, Korea
E-mail: leesw@konkuk.ac.kr

Abstract: In this presentation, novel carbon based electronic and electromechanical devices will be introduced. Carbon nanotubes (CNT) and graphene were utilized for the main materials for our study. The fabrication and physical properties of nano devices, such as carbon nano relay, CNT transistors with graphene moving gate, graphene xylophone will be presented. Possible applications of these devices to the future electronic system will be suggested in the end of this presentation.

Measurement and Characterisation of Surface Properties at Micro-Nano Scales

Xianping Liu

Associate Professor
School of Engineering
University of Warwick
UK
E-mail: X.Liu@warwick.ac.uk

Abstract: In recent years, Dr Liu has been leading research on multi-function characterisation of surface properties. It is especially concerned with surface properties at extremely small scales as they critically influence the design of future generation of components and devices used in engineering, bioengineering and nanotechnology. The multi-function tribological probe microscopy (TPM) is capable of mapping surface topography, friction, Young's modulus and nano-hardness at micro and nanometre scales, in a single scan set-up. These four functions can be linked in space and time, which allows the cross correlation to be carried out, in order to investigate the influence of one function to another. This has led to a wider application covering surface related property measurement and characterisation, affective engineering, human tribology, novel instrument design and development for touch-feel perception, and mechanics and materials for functional surfaces.

The Art of Precision Laser Processing of Surface Materials

Santiago M Olaizola

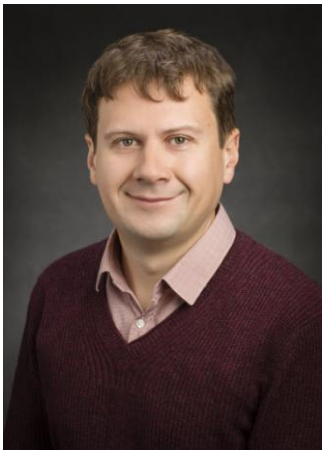
Professor
CEIT-ik4 & Tecnun
University of Navarra
Spain
E-mail: yolaizola@ceit.es

Abstract: Short-pulsed and ultrafast lasers are increasingly being adapted in industrial processes due to the inherent flexibility, high resolution and cost-effectiviness. In this talk we will review several techniques for precision laser manufacturing of materials surfaces to achieve submicronic resolution. The focus will be on laser interference processing and femtosecond laser techniques. We will describe in detail the different techniques and discuss several applications such as semiconductor laser processing, metrology and surface functionalization among others.

Nanopore Sequencing of Biomacromolecules

Aksimentiev Oleksii

Professor
Department of Physics
University of Illinois
USA
E-mail: aksiment@illinois.edu



Abstract:
— DNA sequencing using biological nanopores
— Graphene nanopores
— Nanoplasmonics for DNA sequencing
— Nanopore sequencing of proteins

3D Battery

Wilhelm Pfleging

Professor
Karlsruhe Institute of Technology (KIT)
Institute for Applied Materials (IAM-AWP)
Head of Group-Laser Materials Processing/Lithium-Ion Batteries
Germany
E-mail: wilhelm.pfleging@kit.edu

Abstract: Laser surface texturing of battery materials (electrode, current collector, separator) is developed in order to generate advanced 3D electrode architectures with increased active surface area leading to an improved lithium-ion diffusion kinetics during electrochemical cycling. High-rate capability and an improved cycle stability is achieved. Besides the successful transfer of 3D battery concept to thick film electrodes, a tremendous improvement of electrode wetting with liquid electrolyte could be obtained. This technology can be applied in order to increase cell reliability during the battery production process, to shorten production times of lithium-ion cells as well as to increase battery life-time.

Magnetic and Magnetoelectric Small-scale Machines

Salvador Pané i Vidal

Senior Research Scientist
Head of the IRIS Electrochemistry Laboratory
Institute of Robotics and Intelligent Systems (IRIS)
ETH Zurich
Switzerland
E-mail: vidalp@ethz.ch

Abstract: Over the past decade researchers have been developing micro- and nanorobots for use as biomedical platforms with applications such as chemical sensing and drug delivery. One of the main aspects investigated has been the fabrication and optimization of the motility component of these small agents, and one of the most promising approaches is to use electromagnetic systems to wirelessly control and actuate magnetic micro and nanostructures. In this work, we will present several magnetic micro- and nanoagents that have been produced in our laboratory with a focus on biomedical and environmental applications. Additionally, the exploitation of the magnetoelectric effect in micro- and nanorobots will be also presented.

Graphene Film Mass Production and Applications in Chongqing

Haofei Shi

Professor
Chongqing Institute of Green and Intelligent Technology,
Chinese Academy of Sciences
Chief Scientist
Chongqing Graphene Technology Co. Ltd.,
China
Email: shi@cigit.ac.cn

Abstract: In this talk, I'd like to present our recent progress on graphene film production by chemical vaper deposition. The discussion will be mainly focused on the mass production technology of graphene film as well as cost, yield, and practical applications in flexible touch sensors and wearable devieces.

Ultra-precision Machining of Micro/Nanostructures and Its Application

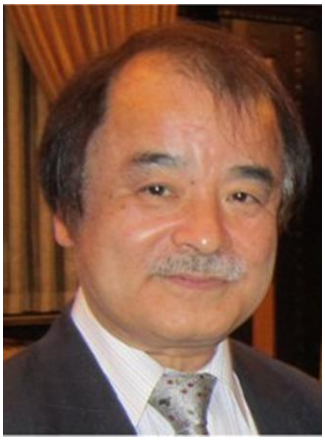
Sandy To

Associate Professor & Associate Director
Advanced Optics Manufacturing Centre
State Key Laboratory of Ultra-precision Machining
Department of Industrial and Systems Engineering
The Hong Kong Polytechnic University
China
E-mail: Sandy.To@polyu.edu.hk

Abstract: Bio-inspired hierarchical micro/nanostructures have offered new functionalities and developments in optical, photoelectric, interfacial, antibacterial, catalytic and mechanical components in a range of modern industries. The newly added functionalities vary with respect to different types and feature sizes of the micro/nanostructures on the primary surface of the components, and require the development of new capabilities for enriching the libraries of existing micro/nanostructures.

This topic will introduce the latest technology of ultra-precision machining of freeform optics and its application. Our recent research on developing a novel Diamond Milling Servo (DMS) based micro/nanomachining for the generation of hierarchical micro/nanostructures will be discussed. Experimentally, the diamond cutting techniques are demonstrated by fabricating a variety of micro/nanostructures on both planar and freeform surfaces.

Study of Carrier Dynamics in Au-TiO_2 Nanoparticle System for Solar Cell and Photocatalyst by Using PEEM and Femtosecond Laser

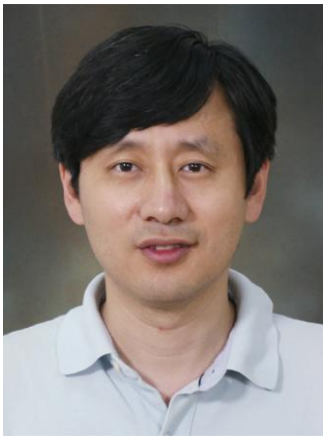


Toshihisa Tomie

Professor
Advanced Semiconductor Research Center (ASRC)
National Institute of Advanced Industrial Science and Technology，AIST
Japan
E-mail: tomie@cust.edu.cn

Abstract: Since the discovery of water splitting effect, TiO_2 has been studied extensively as the most powerful photocatalyst. On the other hand, nano-photonics is also actively studied because electric field and visible-light absorption is enhanced greatly by using nanometer-sized metals. By combining nanophotonics and TiO_2, we can expect to realize high efficiency photocatalyst for low cost solar cell and cleaning urban pollution. For developing high efficiency nano-particle attached photo-catalyst, understanding carrier dynamics is crucially important. In this talk, we report our study on Au-TiO_2 nanoparticle system by using PEEM (photoemission electron microscope) and femtosecond laser for observing carrier dynamics of individual particle.

Visual Servoing of Robots in Uncalibrated Environments



Hesheng Wang

Professor
Department of Automation
Shanghai Jiao Tong University
China
E-mail: wanghesheng@sjtu.edu.cn

Abstract: Visual servoing is an approach of controlling motion of a robot using visual feedback signals from a vision system. An image-based controller usually employs an algorithm which depends on the intrinsic and extrinsic parameters of the camera and the robot physical parameters. The calibration accuracy of these parameters significantly affects the control errors. However, calibration is tedious and costly, even may not be possible in some cases. It is desirable to use uncalibrated visual signals directly in controller design. In this presentation, various visual servoing approaches will be presented to work in uncalibrated environments. These methods are also implemented in many robot systems such as manipulator, mobile robot, soft robot and so on.

Functionalization and Assembly of Nanomaterials for Electrochemical Energy Storage and Solar Energy Conversion

Yuegang Zhang

Professor
Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences
Department of Physics, Tsinghua University
China
E-mail: ygzhang2012@sinano.ac.cn

Abstract: This presentation will discuss the recent progress on synthesis, functionalization, and assembly of carbon and semiconductor nanomaterials. The realization of novel materials design has greatly advanced the energy density and cycling life of electrochemical energy storage devices such as lithium/sulfur batteries and supercapacitors. The hierarchical nanostructures also enabled high efficiency solar water splitting, which paved the way for future hydrogen economy.

Technical Program

(ss: Technical Special Session)

Tuesday, 19 July 2016, 13:30–15:30
Conference Center, -1F

No.	Room	Session
01	Room 1	Sub-wavelength Measurement & Imaging (ss)
02	Room 2	Nanopositioning and Nanomanipulation
03	Room 3	Nanopore Single Molecule Technology (ss)
04	Room 4	Bio-nano Devices and Applications
05	Room 5	Surface Analysis and Application of Functional Nano Materials (ss)
06	Room 6	University of Shanghai Cooperation Organization Nanotechnology

Tuesday, 19 July 2016, 15:50–17:50
Conference Center, -1F

No.	Room	Session
07	Room 1	BIORA (ss)
08	Room 2	FabSurfWar (ss)
09	Room 3	Nanoelectrics and Nanofluidics
10	Room 4	ZnO Nanomaterials and Its Applications (ss)
11	Room 5	Surface Analysis and Application of Functional Nano Materials (ss)

Thursday, 21 July 2016, 8:00-10:00
Conference Center, -1F

No.	Room	Session
12	Room 1	Plasmonic Nanophotonics and Metamaterials (ss)
13	Room 2	Advanced Nano Materials for Semi-conductor Devices (ss)
14	Room 3	Nanofabrication and Nanossembly
15	Room 4	Nanophotonics, Nanoparticles and Nanowires
16	Room 5	Nanomechanics and Nanomechatronics
17	Room 6	NEMS and Their Applications

Thursday, 21 July 2016, 10:20-12:20
Conference Center, -1F

No.	Room	Session
18	Room 1	Machining and Characterization of Multi-scale Micro/nanostructured Functional Surfaces (ss)
19	Room 2	Nanohandling Robots and Systems
20	Room 3	Graphene and Applications
21	Room 4	Nanometrology and Nanocharacterization
22	Room 5	Nanofabrication and Nanocharacterization

Technical Special Session 01
Sub-wavelength Measurement & Imaging

Room 1

13:30–15:30 Tuesday, 19 July

Organizer: Peter J Bryanston-Cross

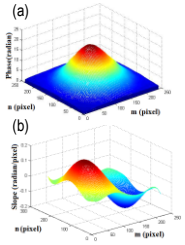
Co-Chair: Chenggen Quan

01-1 13:30–13:50

Displacement and Its Derivatives Measurement from a Single Fringe Pattern in Coherent Optical Techniques

Chenggen Quan, Balakrishnan Deepan, and Cho Jui Tay
Department of Mechanical Engineering, National University of Singapore, Singapore 117576

- Digital holographic interferometry (DHI) (Out of plane displacement, slope, curvature and twist);
- Digital speckle pattern interferometry (DSPI) (Displacement and slope measurement);
- Digital speckle shearing interferometry (DSSI) (Slope, curvature and twist);
- Measure the deformations and its derivatives accurately in sub-wavelength range for static and dynamic applications.



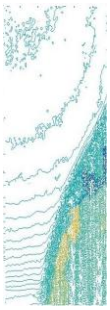
(a) Displacement
(b) Displacement derivative

Notes

01-2 13:50–14:10

Differential Sub-wavelength Interferometric Measurements in Supercritical CO_2

P. Bryanston-Cross***, Derek Paxson* Z Spakovszky* B Timmerman** & Claudio Lettieri*
***Warwick & Changchun University ** Optical Diagnostics Ltd
* Gas Turbine Laboratory Massachusetts Institute of Technology



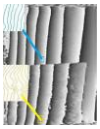
- A novel interferometric measurement of a high pressure supercritical CO_2 flow;
- Phase unwrapping use concatenated individual pixel measurement into a contiguous density mapping of the CO_2 flow;
- The differential density data has been numerically integrated to provide a density profile of the supercritical CO_2 flow.

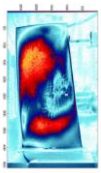
Notes

01-3 14:10–14:30

Examples of Sub-Wavelength Birefringent Measurements

P. Bryanston-Cross*and B Timmerman**
*Warwick University UK & Changchun University**Optical Diagnostics Ltd UK





Three Applications of Birefringent measurement are presented

- The first shows how sub-wavelength measurements of 2nm resolution can be made of a surface;
- The second demonstrates sub-wavelength birefringent measurements in a ruby rod;
- The third approach presents how Aluminum Oxide's weakly birefringent properties can be used to make surface stress impact measurement.

Notes

Technical Special Session 01
Sub-wavelength Measurement & Imaging

Room 1

13:30–15:30 Tuesday, 19 July

Organizer: Peter J Bryanston-Cross

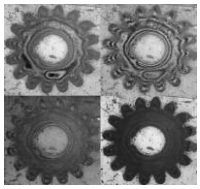
Co-Chair: Chenggen Quan

01-4 14:30–14:50

Optical Image Processing for Nano-Scale Metrology

Lujie Chen
EPD, Singapore University of Technology and Design, Singapore
Chenggen Quan
NE, National University of Singapore, Singapore
Peter Bryanston-Cross
Warwick University, United Kingdom

- Integrated software for optical metrology research;
- Nano accuracy measurement;
- Image acquisition and data processing combo.



Notes

01-5 14:50–15:10

Fabrication of Micropolarizers by Electron Beam Lithography

Yinxue Fan, Miao Yu, Shuyi Li, Zhengxun Song, Zuobin Wang*
International Research Centre for Nano Handling and Manufacturing of China
Changchun University of Science and Technology, China

- Fabricating a thin film micropolarizer using electron beam lithography.
- Optical performance
- The improvement of wire grid polarization characteristics.

overview of the micropolarizer

Notes

Technical Session 02
Nanopositioning and Nanomanipulation

Room 2

13:30–15:30 Tuesday, 19 July

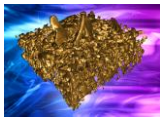
Chair: Kuan Sun, Co-Chair: Peng Yan

02-1 13:30–13:50

Nano-morphology Control of Active Layers in Organic Solar Cells

Kuan Sun
School of Power Engineering, Chongqing University, China
Shirong Lu
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China
Wallace Wong, David Jones and Andrew Holmes
Bio21 Institute, The University of Melbourne, Australia

- The nano-crystal packing was tuned by precise interface modification;
- The mechanism of solvent vapor annealing (SVA) for small-molecular solar cells is unveiled;
- Efficiency of more than 9% was achieved for thick-film small-molecular solar cells.



3D tomogram of the active layer of a small-molecular solar cell

Notes

02-2 13:50–14:10

Design and Assessment of a Piezo-actuated 3-DOF Flexible Nanopositioner with Large Stroke

Hui Tang and Qian Qu
Department of Mechatronic Engineering, Guangdong University of Technology, Guangzhou, China

- A novel 3-DOF complaint parallel mechanism with large stroke and high precision is proposed
- Mechanism design and modeling,FEA analysis and evaluation is conducted
- The mechanism displacement amplification ratio can reach up to 7.34
- It aims to be combined with a commercialized CNC system to fulfill practical ultra-precision machining.

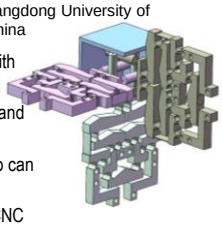


Fig. The proposed 3-DOF nanopositioner

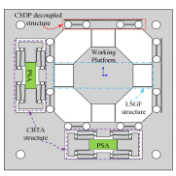
Notes

02-3 14:10–14:30

Modeling and Experimental Testing of a Composite Bridge Type Amplifier Based Nano-positioner

Jianwei Pang, Pengbo Liu and Peng Yan
School of Mechanical Engineering, Shandong University, China
Zhen Zhang
Department of Mechanical Engineering, Tsinghua University, China

- Developing a composite bridge type amplifier based 2-DOF nano-positioner;
- Presenting a hybrid modeling method combining the pseudo-rigid-body-model (PRBM) and Euler-Bernoulli beam theory;
- Predicting the input stiffness and the displacement input/output amplification ratio by established analytical model;
- Verifying the analytical model by the finite element analysis (FEA) method and experiments.



Schematic drawing of the 2-DOF nano-positioning stage

Notes

Technical Session 02
Nanopositioning and Nanomanipulation

Room 2

13:30–15:30 Tuesday, 19 July

Chair: Kuan Sun, Co-Chair: Peng Yan

02-4 14:30–14:50

An FPGA-based Manipulation System for ReRAM Characterization

Jinling Xing, Qingjiang Li, Jiwei Li, Wei Wang, Haijun Liu, Hui Xu
College of Electronic Science and Engineering, National University of Defense Technology, Changsha 410073, P. R. China

- Motivation: electrical characterization process of ReRAM is hindered by the shortages of general semiconductor characterization instruments;
- Present a user-friendly FPGA-based characterization system to characterize standalone and crossbar ReRAM array;
- Introduces in detail the hardware and software design;
- Maximum1.5% read-out error is achieved for resistance measure range of 100Ω～1MΩ.

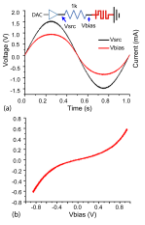


Illustration of the transient response capture ability.

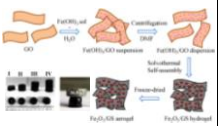
Notes

02-5 14:50–15:10

Solvothermal-Induced 3D Macroscopic Fe_2O_3/Graphene Aerogels for High Capacity and Long-Life Lithium Storage

Xu Chaohe
College of Aerospace Engineering, Chongqing University, China

- Developed a general electrostatic interaction induced self-assembly process to construct graphene-based hybrid aerogels;
- The final nanocrystals were uniformly and tightly decorated onto surface of graphene by solvothermal method;
- The advantages are as following: no nucleation process during solvothermal process;
- Finally, the nanocrystals were uniformly anchored onto graphene with very small sizes..



Schematic illustration of preparation of Fe_2O_3/graphene aerogels

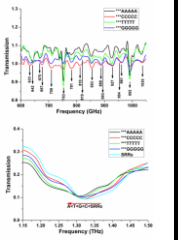
Notes

02-6 Poster 1

Detection of Oligonucleotides Based on Terahertz Spectroscopy and Microstructure

Mingjie Tang, Mingkun Zhang, Shihan Yan, Liangping Xia, Zhongbo Yang, Chunlei Du, Hong-Liang Cui and Dongshan Wei*
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- A terahertz spectroscopic study is carried out to analyze DNA mutations in a label-free manner;
- The mutations on single-stranded oligonucleotides has first been discriminated based on the microchannel;
- The mutations has also been verified based on the split-ring resonators (SRRs);
- THz spectroscopic technology can be considered as a potential diagnostic tool for investigating molecular reactions.



THz transmission spectroscopy base on the microchannel and SRRs

Notes

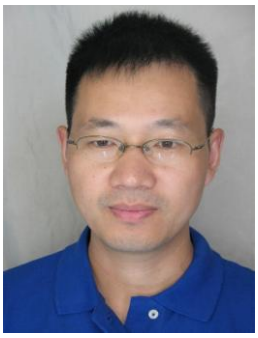
Technical Special Session 03
Nanopore Single Molecule Technology

Room 3

13:30–15:30 Tuesday, 19 July

Organizer: Deqiang Wang

Co-Chair: Yunjiao Wang

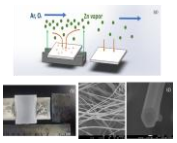


03-1 13:30–13:50

Controllable Synthesis of Large Scale, Catalyst-free, Lateral ZnO Nanowires Network

Guan Jian, Guo Shuxu, Gao Fengli
College of Electronic Science and Engineering, Jilin University, China
Jiang Haitao, Lu Wenqiang, Wang Deqiang
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- Controllable synthesis of lateral ZnO nanowire network;
- Catalyst-free nanostructure manufacture on the SiO_2 layer of Si substrate;
- ZnO nanowire network growth on large scale substrate;
- Model of ZnO vapor transportation and deposition mechanism.



The model of deposition mechanism and results for ZnO NW synthesis on large substrates

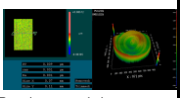
Notes

03-2 13:50–14:10

Fabricating Fresnel Mirrors Imaged in Visible Light Region by Ultra Precision manufacturing technology

Weiguo Zhang[1,2],Guodong Zhu[2],Xin Xiong[2],Fenglei Liu[2]
Deqiang Wang[2],Chunlei Du[1,2*]
1、School of Optoelectronic Engineering, Chongqing University, China
2、Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- This paper presents a Fresnel mirrors ultra precision forming method, which can turn the Fresnel mirrors with an excellent imaging performance in visible light region. The surface roughness of the Fresnel mirror can be achieved as small as 1 nm, and the surface accuracy can be up to 0.23 lambda @ 632.8 nm after removing the spherical aberration, which make this kind of Fresnel mirror extremely promising for applications in ultrathin and light optical imaging system.



Roughness and shape accurac of Fresnel mirror fabricated by Our method

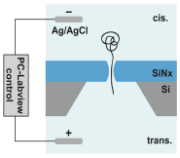
Notes

03-3 14:10–14:30

Solid-state Nanopores Fabricated by Pulse-controlled Dielectric Breakdown

Yue Zhao and Hong-Liang Cui
College of Instrumentation and Electrical Engineering, Jilin University, China
Daming Zhou, Deqiang Wang
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China
Helei Wei
College of Physical Science and Technology, Sichuan University, China

- Fabricating solid-state nanopores by using adjustable pulses controlled dielectric breakdown in electrolyte;
- Controlling precision of nanopores with sub-nanometre;
- Excellent electrical signals and long DNA translocation times with high signal-to-noise ratio.



Schematic cross-section of solid-state nanopore measuring systerm.

Notes

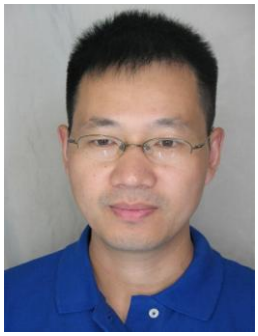
Technical Special Session 03
Nanopore Single Molecule Technology

Room 3

13:30–15:30 Tuesday, 19 July

Organizer: Deqiang Wang

Co-Chair: Yunjiao Wang



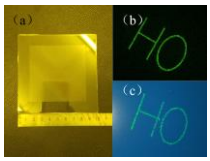
03-4 14:30–14:50

Fabrication of Large Area Diffractive Optical Elements by Laser Direct Writing

Yunjiao Wang, Weiguo Zhang, Zheng Yang, Xin Xiong, Liangping Xia, Mingyou Gao, Dong Zhang, Deqiang Wang*, Jiahu Yuan*

Chongqing Key Laboratory of Multi-scale Manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences , Chongqing, China

- Fabricating diffractive optical elements (DOEs) with four phase levels by the Laser Direct Writing technology;
- One computation method is provided to optimize the step depth, which could improve efficiency of DOEs;
- The fabricated DOEs devices with good optical properties;
- The effective areas of the DOEs pattern are as large as 49 cm^2.



The fabricated DOE (a) and its simulated (b) /experimentally obtained (c) diffraction image.

Notes

03-5 14:50–15:10

Enhanced the Optical Transmission Efficiency by Funnel-shaped Nanopore

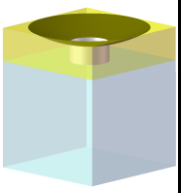
Haitao Wang and Guodong Wang

Electrical Engineering and Automation, Henan Polytechnic University, Jiaozuo,China

Helei Wei,Yunsheng Deng ,Jing Wang, Deqiang Wang

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences,Chongqing,China.

- Funnel-shaped nanopores of 3-D structure have been made;
- The structure is made by FIB with the method of gray scale;
- Stronger electric fields are confined in the holes;
- Enhanced the optical transmission efficiency obviously.



Funnel-shaped nanopore

Notes

03-6 15:10–15:30

A Microfluidic Chip for Terahertz Spectral Detection

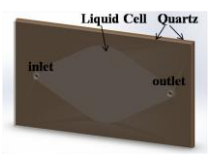
Mengwan Liu and Hong-Liang Cui

College of Instrumentation and Electrical Engineering, Jilin University, China

Daming Zhou, Mingkun Zhang, Hong-Liang Cui, Deqiang Wang

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- The SU-8 fluidic chip is fabricated with ultra-thick micro-fluidic structures for THz spectral detection;
- Depth of the structure between two pieces of quartz is designed to be 50 μm;
- Water absorption coefficient detected at 0.1 THz-1.5 THz shows a good stability of the chip;
- The microfluidic chip is useful and convenient for terahertz spectral detection with liquid sample.



A 3D model of the microfluidic chip.

Notes

Technical Session 04
Bio-nano Devices and Applications
Room 4
13:30–15:30 Tuesday, 19 July
Chair: Miao Zhou, Co-Chair: Shuangxi Xie

04-1 13:30–13:50

Novel Algae Guiding System to Robotize Algae Cells

Shuangxi Xie[1,2], Niandong Jiao[1,*], Steve Tung[1] and Lianqing Liu[1,*]
[1] State Key Laboratory of Robotics, Shenyang Institute of Automation, Chinese Academy of Sciences, Shenyang, China
[2] University of Chinese Academy of Sciences, Beijing, China
*Corresponding-author: ndjiao@sia.cn; lqliu@sia.cn

- We developed a novel algae guiding system to robotize the algae cell *Chlamydomonas reinhardtii;*
- Algae cell could be controlled to traverse crossroad as a microrobot and transport microscale loads;
- Robotized algae cells were expected to function in microassembly and bring significant breakthrough in bioactuation.

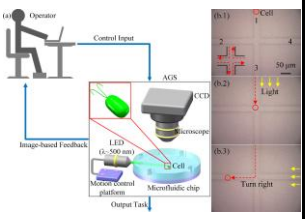


Figure 1. (a) Schematic diagram of the microsystem. (b) Cell can be controlled to go through all the channels in turn as a microrobot .

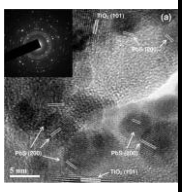
Notes

04-2 13:50–14:10

Zinc Sulfide as the Capping or Exchanging Medium for Bulk Heterojunction Solar Cells

Lidong Sun
School of Materials Science and Engineering, Chongqing University, PR China

- Monodisperse PbS quantum dots capped with ZnS
- Bulk heterojunction solar cells;
- ZnS as the capping and exchanging medium.



This presentation will introduce our recent studies on an all-solid-version of bulk heterojunction solar cells, where PbS quantum dots capped with amorphous ZnS are adopted.

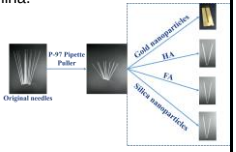
Notes

04-3 14:10–14:30

Novel Surface Engineered Micro-needles Towards Bio-analytical Applications

Ru Zhang †, Kai Guo †, Xuming Sun, Deepanjali Gurav, Kun Qian*
†These authors contributed equally to this work.
Center for Bio-Nano-Chips and Diagnostics in Translational Medicine, School of Biomedical Engineering, Shanghai Jiao Tong University, 1954 Huashan Road, Shanghai, 200030, China.

- Synthesis and functionalization of several nanoparticles and polymers
- Successfully fabrication of several new kinds of micro-injection needles characterized by SEM and EDS
- a potential platform for bio-analytical applications



Scheme: fabrication process of micro-injection needles

Notes

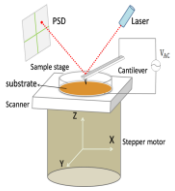
Technical Session 04
Bio-nano Devices and Applications
Room 4
13:30–15:30 Tuesday, 19 July
Chair: Miao Zhou, Co-Chair: Shuangxi Xie

04-4 14:30–14:50

A method for the mechanical stimulation of living single-cells using a voltage-excited AFM probe

Feng Hou, Zuobin Wang* , Yujing Zhao , Yingmin Qu, Xinyue Wang
JR3CN & CNM, Changchun University of Science and Technology, China

- We developed a method to drive the AFM conductive probe cantilever oscillation for stimulating living single cells.
- The AFM conductive probe is used as both a nanoeletrode and a nanoactuator to stimulate the living cells.
- The developed system is an efficient stimulating tool for the study of cellular physiological behaviors.



A method for the mechanical stimulation of living single-cells using a voltage-excited AFM probe

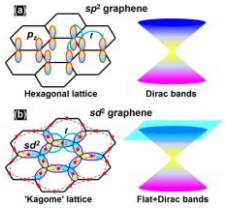
Notes

04-5 14:50–15:10

Theoretical Understanding and Design of 2D Hexagonal Structures for Catalysis Chemistry and Semiconductor Physics

Miao Zhou
College of Optoelectronic Engineering, Chongqing University, China

- Graphene as novel support for heterogeneous catalysts;
- Integration of artificial graphene for semiconductor industry;
- Discovery of a new 2D material-sd^2 graphene;
- 2D topological insulator, quantum anomalous Hall effect;
- Theoretical calculations and design.



(a) Conventional graphene and (b) the newly-discovered sd^2 graphene.

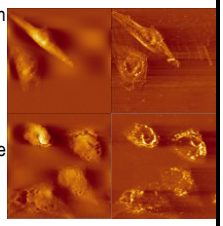
Notes

04-6 15:10–15:30

Effect of Curing Time on Cell Structures

Yujing Zhao, Zuobin Wang*, Feng Hou, YanLiu, Xinyue wang, Yingmin Qu, Wenxiao Zhang
JR3CN & CNM, Changchun University of Science and Technology, China

- We detected the difference of the cells which were cured with different time;
- The optimized curing time of cells was obtained;
- The structures of the cells were changed with the curing time.



Notes

Technical Special Session 05
Surface Analysis and Application of Functional Nano Materials

Room 5

13:30–15:30 Tuesday, 19 July

Organizer: Qiang Li

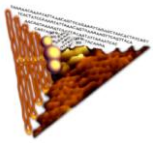
Co-Chair: Dan Xia

05-1 13:30–13:50

Transitional Self-Assembly of Biomolecules using DNA

Hüsnü Aslan and Mingdong Dong
iNANO, Aarhus University, Denmark

- Monitoring patterned enzymatic polymerization on 2D DNA origami at single-molecule level;
- Enabling dimensional transition of multi-molecular (biological and non-biological) on-site assemblies;
- Possible applications such as in computation and biosensors are discussed;
- DNA origami framework is used for protein patterning;
- A novel multi-molecular patterning method is introduced;



Notes

05-2 13:50–14:10

Charge-Pattern Indicated Relaxation Dynamics and T_g of Polymer thin films Studied by AFM

Guan Li
Department of Chemistry, Renmin University of China

- Patterned charges are fabricated using the electric micro-contact printing technique by a patterned template;
- The differences of local relaxation between pattern charged and neutral area are characterized using AFM;
- Relaxation dynamics could be obtained by monitoring the discharging process of patterned charges;
- The T_g of thin or ultrathin film is calculated by fitting the charges decay tendencies.

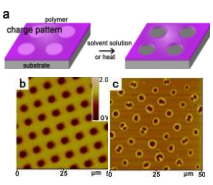


Fig.1 The fabrication of charge patterns(a, b) and patterned charges indicated local relaxation monitored by AFM(c)

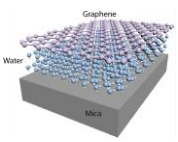
Notes

05-3 14:10–14:30

Investigation of Water Adlayers through Graphene Templating

Qiang Li
Interdisplinary Nanoscience Center, Aarhus University, Denmark
Key Laboratory of Colloid and Interface Chemistry, Ministry of Education, Shandong University, China

- With the assistance of graphene, the dynamic behavior of water molecules was directly observed;
- The ice-like water adlayer, grown up to three layers, as well as thicker liquid-like water domain, was directly visualized;
- The Stranski-Krastanov growth model is more appropriate to describe the whole water growth process.



Notes

Technical Special Session 05
Surface Analysis and Application of Functional Nano Materials

Room 5

13:30–15:30 Tuesday, 19 July

Organizer: Qiang Li

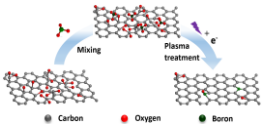
Co-Chair: Dan Xia

05-4 14:30–14:50

Plasma-induced High-efficiency Synthesis of Heteroatom Doped reduced Graphene Oxide

Shaobo Li and Lichun Dong
School of Chemistry and Chemical Engineering, Chongqing University, China

- Heteroatom doped reduced graphene oxide was synthesized *via* a facile and highly efficient plasma-induced approach;
- This process has the feature of low cost, environmentally friendly, and scalability;
- Supercapacitors based on the as-synthesized sample exhibit an exceptional specific capacitance.



Schematic of the plasma-induced synthesis of boron-doped reduced graphene oxide

Notes

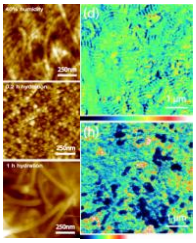
05-5 14:50–15:10

3M-NANO 2016 Special Session: Surface Analysis and Application of Functional Nanomaterials

The Application of AFM in Biological Tissue and Related Diseases

Dan Xia
Interdisplinary Nanoscience Center, Aarhus University, Denmark
Institute of Energy Equipment Materials, Hebei University of Technology, China

- Human cornea and Fuchs endothelial dystrophy revealed by AFM;
- Osteocyte lacunar-canalicular network-associated bone matrix characterized by AFM;
- Dental abnormalities studied by AFM;
- Smooth muscle cells and the biomimetic Cardiovascular stent studied by AFM;
- Structure and nanomechanical mapping may apply for the future diagnosis and assessment or even pathological analysis.



Notes

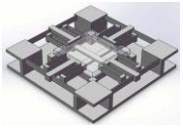
Technical Session 06
University of Shanghai Cooperation Organization Nanotechnology
Room 6
13:30-15:30 Tuesday, 19 July
Chair: Zhankun Weng, Co-Chair: Peter Lega

06-1 13:30–13:50

Design of a Flexure-based XY Positioning Stage with Balanced Axial Forces on Decoupling Modules

Zhen Zhang and Zhiqing Liu
Department of Mechanical Engineering, Tsinghua University, China
Peng Yan
School of Mechanical Engineering, Shandong University, China

- A beam flexure-based XY positioning stage with an axial force balanced design is proposed;
- By connecting two decoupling modules, axial forces are evenly applied to each side of motion stage;
- In-plane rotation can be significantly restricted;
- Monolithical fabrication of proposed spatial configuration can be resorted to additive manufactured technology;



Schematic view of the proposed XY positioning stage

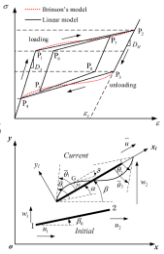
Notes

06-2 13:50–14:10

Dynamic Modeling and Analysis of Pseudo-elastic Flexure Hinges

Wei Dong, Junxian Lin, Miao Yang and Zhijiang Du
State Key Laboratory of Robotics and System
Harbin Institute of Technology, Harbin, China

- Dynamic modeling of flexure hinges made of shape memory alloys is presented;
- The model considers material and geometrical nonlinearities;
- The method is validated by comparison with ABAQUS simulation;
- This work is significantly important for vibration suppression of the compliant mechanism.



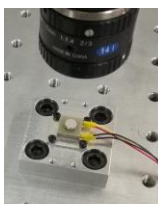
Notes

06-3 14:10–14:30

Horizontal Two-Dimensional Nano-positioner based on Shear Plate Piezoelectric Actuators

Haiyang Li, Zhijiang Du and Wei Dong
State Key Laboratory of Robotics and System,
Harbin Institute of Technology, China

- A planar 2-D nano-positioner has been designed by using the shear plate piezoelectric actuators;
- The performance of the nano-positioner actuated by different driving pulses has been simulated and discussed;
- A prototype of the nano-positioner has been evaluated by a CCD camera;
- The methodology in this paper can be employed and extended to other piezoelectric actuators.



The experiment setup using a CCD camera as the observing device

Notes

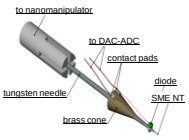
Technical Session 06
University of Shanghai Cooperation Organization Nanotechnology
Room 6
13:30-15:30 Tuesday, 19 July
Chair: Zhankun Weng, Co-Chair: Peter Lega

06-4 14:30–14:50

Thermally Controlled Nanoobjects Manipulation System Based on Composite Ti_2NiCu/Pt Nanotweezers

A.Zhikharev[1], M.Beresin[1,3], P.Lega[1], V.Koledov[1], N.Kasyanov[1,3], S. von Gratowski[1], G.Martynov[1,3], A.Irzhak[2,3]
[1]IRE RAS, Russia
[2]NUST MISIS, Russia
[3]IMT RAS, Russia

- The nanomanipulation system based on nanotweezers with SME demonstrated;
- The system controlled automatically by resistive heating element;
- The system has demonstrated its compatibility with existing nanopositioning systems such as Kliendiek™.



Schematic representation of nanotweezers handling and heating system

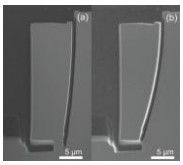
Notes

06-5 14:50–15:10

The Shape Memory Effect in Nanoscale Composites Based on Ti_2NiCu Alloy

[1,2]A.Irzhak, [2]N.Tabachkova, [2]D.Dikan, [3]N.Sitnikov, [3]A.Shelyakov, [4]V.Koledov, [4]P.Lega, [4]V.Shavrov, [4]A.Mashirov, [4]S.von Gratowski, [4]A.Zhikharev, [4]V.Pokrovsky, [4]S.Zibtsev, [4]D.Zakharov, [4]P.Mazaev, [2,4]M.Berezin, [2,4]N.Kasyanov, [2,4]G.Martynov, [4]A.Orlov
[1]IMT RAS, Russia
[2]NUST MISIS, Russia
[3]NRNU MEPhI, Russia
[4]IRE RAS, Russia

- SME observed in layered composite microstructors produced by FIB CVD technology
- The thickness of the SME active layer is at least 80nm
- the physical and technological restrictions were examined


Composite SME microactuator in opened (a) and closed (b) position

Notes

06-6 15:10–15:30

Transferring Porous Layer from InP Wafer Based on the Disturbance

Yang Zhang, Liang Cao, Xiangyu Chai, Kaihua Liang, Zhankun Weng*, Zhengxun Song, Hongmei Xu, Zuobin Wang
International Research Centre for Nano Handling and Manufacturing of China, Changchun University of Science and Technology, China

- A phenomenon that porous layer will be peeled by disturbance was observed;
- 3D structures produced are crucial for the optoelectronics and optical communication;
- How to transfer the porous structures is still an important challenge from the wafers;
- The correlation among the disturbance, the potential bursting of the oscillation, and the peeled porous layer was discussed.

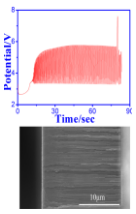


Fig.1 shows the crack of SEM image and the potential bursting of the oscillation

Notes

Technical Special Session 07
BIORA
Room 1
15:50–17:50 Tuesday, 19 July
Organizer: Dayou Li
Co-Chair: S. Nikolov

07-1 15:50–16:10

Fuzzy Logic Based Intention Recognition in STS Processes

Hang Lu Dayou Li and Renxi Qiu
Institute for Research in Applied Computing,
University of Bedfordshire, United Kingdom

- Background knowledge on sit to stand (STS) difficulties, biomechanics and contemporary solutions (assistive devices);
- Extraction of shift in centre of pressure (COP) as the key feature to feed the fuzzy logic classifier;
- Recognitions of human users' STS intentions for the purpose of providing the "assistance as needed";
- Contributions in handling uncertainties within the time constraints.

Notes

07-2 16:10–16:30

Back Propagation Neural Networks Based Hysteresis Modeling and Compensation for a Piezoelectric Scanner

Yinan Wu, Yongchun Fang, Xiao Ren, and Han Lu
Institute of Robotics and Automatic Information System, Nankai University,
Tianjin Key Laboratory of Intelligent Robotics, China

- In this paper, a two hidden layers BPNN consisting of an input layer, two hidden layers, and an output layer is utilized to model for the hysteresis effect of a piezoelectric scanner;
- Subsequently, a method based on cubic spline interpolation is proposed to compensate for the hysteresis behavior effectively;
- The experiment results with low and high frequency both show that the proposed method improves the performance of the AFM system.

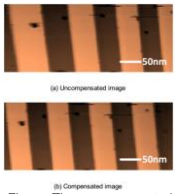


Figure: The uncompensated and compensated images with frequency 5Hz

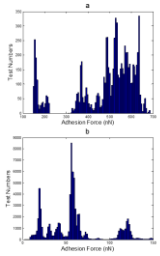
Notes

07-3 16:30–16:50

Study of Adhesion Force between Cellulose Micro-sphere and Cellulose Membrane

Yuli Lai[1], Hao Zhang[2], Yasuhito Sugano[3], Johan Bobacka[4], Hui Xie[2], Pasi Kallio[1]
[1]Department of Automation Science and Engineering, Tampere University of Technology, Tampere, Finland
[2] The State Key Laboratory of Robotics and Systems, Harbin Institute of Technology, Harbin, China
[3]Laboratory of Organic Chemistry, Department of Chemistry, Faculty of Science, University of Helsinki, Helsinki, Finland
[4]Johan Gadolin Process Chemistry Centre, Laboratory of Analytical Chemistry, Åbo Akademi University, Turku, Finland

- Adhesion Force measurements between Cellulose Micro-sphere (CS) and Cellulose Membranes (CM);
- A self-prepared colloidal AFM probe and a customized dual-probe AFM were employed;
- Two types of CM with different cellulose concentration 1.5% and 2% were used as test samples;
- Over ten thousand tests were done on sample CM 1.5% and CM 2%.



Histograms of Adhesion Force on CM 1.5% and 2%

Notes

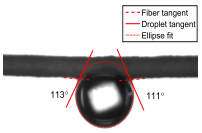
Technical Special Session 07
BIORA
Room 1
15:50–17:50 Tuesday, 19 July
Organizer: Dayou Li
Co-Chair: S. Nikolov

07-4 16:50–17:10

Automated Estimation of Contact Angle on Hydrophobic Fibers using a Microrobotic Platform

Juha Hirvonen, Yuli Lai and Pasi Kallio
Dept. of Automation Science and Eng., Tampere University of Tech., Finland
Gisela Cunha and Orlando Rojas
Dept. of Forest Products and Tech., Aalto University, Finland

- Fibers are an important material;
- Wetting properties of fibers are essential for the applications and the product development;
- Current state-of-the-art methods are limited in fiber dimensions and fiber handling is manual;
- We present an automated contact angle measurement for hydrophobic fibers;
- Experiments are performed on a microrobotic platform that enables efficient fiber handling.



A droplet on a fiber with the estimated contact angles plotted

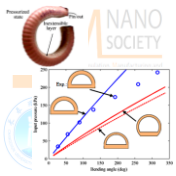
Notes

07-5 17:10–17:30

Model-Based Design Optimization of Soft Fiber-Reinforced Bending Actuators

S. Nikolov, V. Kotev and K. Kostadinov
Institute of Mechanics, Bulgarian Academy of Sciences, Bulgaria
F. Wang, C. Liang and Y. Tian
School of Mechanical Engineering, Tianjin University, China

- A physically-based analytical model for hemi-circular soft bending actuators with fiber reinforcement was developed and used for virtual design optimization;
- The goal was to find the optimal thicknesses of the actuator walls that minimize the necessary input pressure for bending and maximize the contact force;
- Optimized design operates at 48 % lower input pressure and generates 18 % stronger contact force compared to actuator with uniform wall thicknesses.



Dimensional optimization of actuator cross-section

Notes

07-6 17:30–17:50

Efficient Cell Electrofusion Chip Based on Micromanipulation

Junhui Zhu and Yong Wang
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai 200072, China
Chengsong Shu and Changhai Ru
Research Center of Robotics and Micro Systems, Soochow University, Suzhou 215021, China

- This paper reported a micro-manipulation approach for SCNT by using a novel cell electrofusion Chip;
- The chip prototype was fabricated on a ITO substrate that was subsequently covered by a positive photoresist film. Micropore electrodes measuring 25μm in diameter were fabricated on the film by lithography;
- Experimrntal result showed that electrodes with a 10mm spacing can pair and fusion the cells efficiently.

Cell electrofusion Chip

Notes

Technical Special Session 08
FabSurfWar
Room 2
15:50-17:50 Tuesday, 19 July
Organizer: Xianping Liu
Co-Chair: Wilhelm Pfleging

08-1 15:50–16:10

Effects of Picosecond Laser Power Variation on Laser-induced Changes of Titanium

Chengjuan Yang, Zhen Yang, Yanling Tian*
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, China
Yanling Tian*, Xianping Liu
School of Engineering, University of Warwick, UK

- Main ablation products of titanium by picosecond laser with different power were TiO_2 and TiC;
- Amorphization degree of ablated titanium was intensified with picosecond laser power increasing;
- Increased laser power intensified the heat accumulation effect, which induced more thermal and mechanical damages;
- This study benefits the improvement of process control and product quality of titanium in future.

Notes

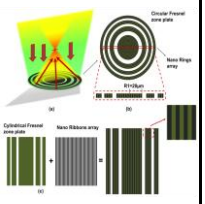
08-2 16:10–16:30

Graphene Plasmonic Lenses

Sunan Deng, Haider Butt*, Bruno Dlubak, Piran R. Kidambi, Pierre Seneor, and Stephane Xavier, Kyle Jiang

School of Mechanical Engineering, University of Birmingham, UK

- A type of graphene based metamaterial lenses is proposed;
- Computational modelling shows that the focal intensity of such a metamaterial lens can be 80 times higher than a conventional graphene based FZP lens;
- The enhanced light wavelengths could be tuned;
- The findings could be used for wavelength selective electro-optical applications operating in the infrared and terahertz ranges.



Notes

08-3 16:30–16:50

Measurement of Viscoelastic Properties of Living SMCC-7721 Cells by Atomic Force Microscopy

Xinyao Zhu, Xianping Liu
School of Engineering, University of Warwick, UK
Nan Zhang, Zuobin Wang
International Research Centre for Nano Handling and Manufacturing of China, Changchun University of Science and Technology, China

- Atomic force microscope (creep test) was used to investigate viscoelastic properties of human hepatocellular carcinoma cells .
- Viscoelastic Hertz model was used to fit the displacement-time curves, from which Young's modulus and viscosity are extracted.
- The order of magnitude of two properties coincide with those of former studies
- Contribution: this paper quantitatively characterizes cell viscoelasticity and validate the fitting model

Notes

Technical Special Session 08
FabSurfWar

Room 2

15:50-17:50 Tuesday, 19 July

Organizer: Xianping Liu

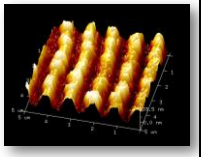
Co-Chair: Wilhelm Pfleging

08-4 16:50–17:10

Laser Interference Patterning and Laser-induced Periodic Surface Structure Formation on Metallic Substrates

Yijing Zheng, Zhenhua An, Peter Smyrek, Hans Jürgen Seifert and Wilhelm Pfleging
IAM-AWP, Karlsruhe Institute of Technology, Germany
Tim Kunze, Valentin Lang and Andrés-Fabián Lasagni
Fraunhofer Institute for Material and Beam Technology, Germany

- Laser-induced periodic surface nano-structuring (LIPSS) and laser interference micro-patterning of metals were investigated as function of laser parameters;
- Periodic surface structures in the range of 200-1000 nm (LIPSS) could be achieved;
- Tremendous increase of thick film adhesion strength on laser modified metallic foils.



Laser-induced periodic surface structure with a periodicity of 1000 nm on stainless steel surface

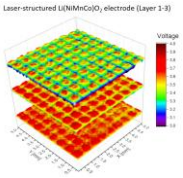
Notes

08-5 17:10–17:30

Laser-Induced Breakdown Spectroscopy as a Powerful Tool for Characterization of Laser Modified Composite Materials

Peter Smyrek, Yijing Zheng, Hans Jürgen Seifert, and Wilhelm Pfleging
IAM-AWP, Karlsruhe Institute of Technology, Germany
Peter Smyrek and Wilhelm Pfleging
Karlsruhe Nano Micro Facility, Germany

- LIBS was applied in order to investigate the lithium distribution in laser modified battery materials;
- Lithium distribution was investigated after electrochemical cycling at different State-of-Health;
- Evaluation of chemical degradation mechanisms.



Notes

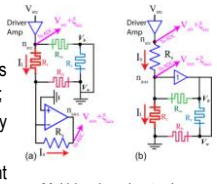
Technical Session 09
Nanoelectrics and Nanofluidics
Room 3
15:50-17:50 Tuesday, 19 July
Chair: Lu Li, Co-Chair: Yanjun Li

09-1 15:50–16:10

Practical Considerations of Read-out Circuits for Passive, Multi-level ReRAM Arrays

Jinling Xing, Hui Xu, Jiwei Li, Wei Wang, Haijun Liu, Qingjiang Li
College of Electronic Science and Engineering, National University of Defense Technology, Changsha 410073, P. R. China

- Massive ReRAM application is hindered by sneak-path problem;
- Present two typical sneak-path mitigation bias schemes for passive, multi-level ReRAM array;
- Deduce theoretically the read-out accuracy degradation induced by ADC misreading;
- Design verification circuit system and present the experimental results.



Multi-level read-out schemes illustration. (a) TIA-read schemes (b) PD-read schemes.

Notes

09-2 16:10–16:30

Research on Common Path OCT System's Light Source and Interferometer Module

Yanjun Li, Pengwei Wang, Yanwei Liu and Chengzhi Li
College of Electrical Engineering, Henan University of Technology, Zhengzhou, Henan, 450001, China

Bullet points

- The bandwidth of the light source determines the axis resolution of the CPOCT;
- The central wavelength of the light source also determines the measurement depth of the bio-sample;
- Near infrared light, high irradiation and low coherence are the most important factors of CPOCT system;

contribution

Compared with the traditional OCT system, the reference arm and the signal arm of the common path interferometer module INT-COM-1300 are exactly symmetrical, which overcomes the disadvantage of the traditional OCT system's separation structure of the reference arm and the signal arm.

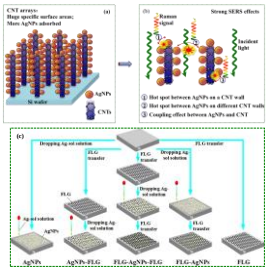
Notes

09-3 16:30–16:50

Surface-enhanced Raman Scattering Activities of Carbon Nanotubes/Graphene/AgNPs

Jie Zhang and Yong Zhu
College of Optoelectronic Engineering, Chongqing University, China

- A comparative study on the optical properties and SERS effects of the hybrid structures;
- A comparative study on the interactions between AgNPs and CNTs/Graphene;
- A "vector decomposition method" was used to decompose the total values of position into the variations induced by strain and doping.



CNTs/Graphene/AgNPs as SERS substrates

Notes

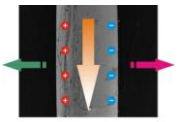
Technical Session 09
Nanoelectrics and Nanofluidics
Room 3
15:50-17:50 Tuesday, 19 July
Chair: Lu Li , Co-Chair: Yanjun Li

09-4 16:50–17:10

Voltage Dependent Fiber Optic Surface Plasmon Resonance Sensor

Yu Huang, Haiyan Cao, Yufeng Sun and Hongliang Cui
Chongqing Institute of Green and Intelligent Technology,
Chinese Academy of Sciences, China

- A single wavelength monitoring scheme is proposed to detect the presence of voltage;
- The dynamic response of fiber optic SPR sensor is dependent on the monitoring wavelength;
- The capability of fiber optic SPR sensor to detect the presence of voltage has been demonstrated;
- The potential induced response is dependent on the potential step width and electrolyte concentration.



Notes

09-5 17:10–17:30

Terahertz Waveplate Based Metamaterial

Ziyin Zhang, Liangping Xia*, Xinqun Zhang, Xin Zhang, Dongshan Wei, Hongliang Cui, Chunlei Du
Key Laboratory of Multi-scale Manufacturing Technology, Chongqing institute of green and intelligent technology, Chinese Academy of Sciences, Chongqing, 400714, China

- The terahertz waveplate consists of a single-layered metallic subwavelength split ring resonant array;
- The split ring is anisotropic in the x, y directions, which leads to the different resonance in the two directions;
- The different effective refractive index is obtained with the structure anisotropy;
- In the experiment, the maximum transmission phase difference is close to 90 degree at 0.35THz in the x and y direction as shown in the figure, which is a approximate quarter waveplate.

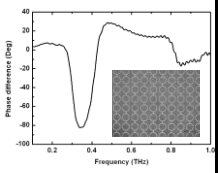


Figure. The structure of the terahertz waveplate and the transmission phase difference

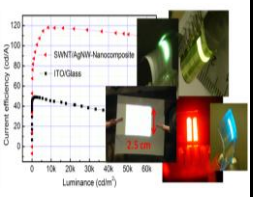
Notes

09-6 17:30–17:50

Stretchable Flexible and Self-healable Electronics based on Silver Nanowires

Lu Li, Qibing Pei
Co-innovation Center for Micro/Nano Optoelectronic Materials and Devices, Research Institute for New Materials Technology, Chongqing University of Arts and Sciences, Chongqing, China, 402160

- Flexible large scale touch panel based on silver nanowires (AgNWs) conductive films;
- Flexible OLEDs and OPVs based on AgNW composite substrates;
- Intrinsically stretchable OLEDs and OPVs based on AgNW-Polymer electrodes;
- Self-healable touch panels based on novelty healable AgNW-Polymer transparent conductive substrate.



The different colors of flexible OLED pictures based on AgNW substrate

Notes

Technical Special Session 10
ZnO Nanomaterials and Its Applications
Room 4
15:50–17:50 Tuesday, 19 July
Organizer: Wenqiang Lu
Co-Chair: Zhenhu Li

10-1 15:50–16:10

Regrowth of GaN Pyramids at the Tops of GaN Nanocolumn Arrays by RF-MBE

Hongxia Ran and Jinshe Yuan

College of Physics and Electronic Engineering
Chongqing Normal University, China

- The as-grown GaN nanostructures are characterized by the in-situ reflection high-energy electron diffraction (RHEED), field emission scanning electron microscopy (FESEM) ;
- The V/III ratio has a great effect on the lateral growth of pyramid, the V/III ratio of 4:1 is beneficial to the growth of facet, while that of 8:1 is the facets and the formation mechanism of GaN pyramids is discussed.

Notes

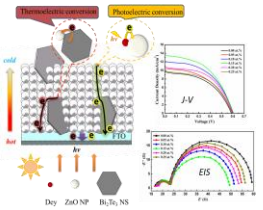
10-2 16:10–16:30

Enhanced Dye-Sensitized Solar Cells Performance by Bi_2Te_3/ZnO Nanocomposite Photoanode

Kai Wan, Liang Fang and Fang Wu
Department of Applied Physics, College of physics, Chongqing University, Chongqing

Main Contents:

- Hexagonal Bi_2Te_3 nanosheets were synthesized by a hydrothermal method.
- Both thermal and photo energy can be converted in the DSSCs simultaneously.
- The highest η of 4.10% can be achieved in a DSSC with 0.15 at.% Bi_2Te_3 content.
- The increase of η due to the thermoelectric effect, high light efficiency and η_{cc}.



In our work, the performance of dye-sensitized solar cells was highly improved through a method of dual-energy conversion, which provide a new reference idea for enhanced performance of dye-sensitized solar cells.

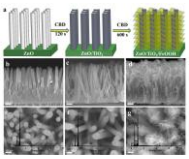
Notes

10-3 16:30–16:50

ZnO-based 3D Hierarchical Nanostructural Photoanode for Photoelectrochemical reaction

Zhenhu Li, Shuangyi Liu and Wenqiang Lu
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, Chongqing 400714, P. R. China.

- We designed and fabricated a novel 3D ZnO-based hierarchical nanostructure by simple method;
- With applying such hierarchical nanostructure as a photoanode of photoelectrochemical water reaction, higher photostability and photocurrent density are gained comparing with that of reported ZnO based nanostructures;
- Based on such environmental friendly hierarchical nanostructure, photoelectrochemical water splitting and the other similar reactions could be performed effectively and economically;
- Zhenhu Li is the frist author.



Schematic illustrations and SEM images of 3D ZnO/TiO2/FeOOH heterojunction arrays.

Notes

Technical Special Session 10
ZnO Nanomaterials and Its Applications

Room 4

15:50–17:50 Tuesday, 19 July

Organizer: Wenqiang Lu

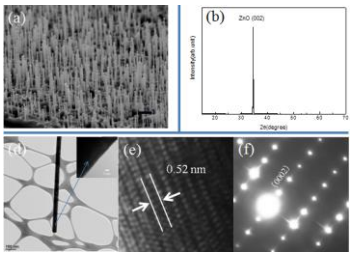
Co-Chair: Zhenhu Li

10-4 16:50–17:10

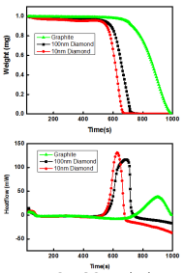
Low Temperature Growing High Quality ZnO Nanowire Array with Nanodiamond as Reductant

Xin Li, Shuanglong Feng, and Wenqiang Lu

Chongqing Key Laboratory of Multi-Scale Manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, Chongqing, 400714, PR China



Structural properties analysis



TG-DSC analysis

Notes

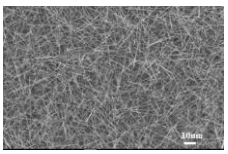
10-5 17:10–17:30

Catalyst-Free CVD Synthesis of ZnO Nanowire Networks on SiO_2 Substrate and Its Photoresponse

Liping Xu ,Wenqiang Lu and Zhaoyao Zhan

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- Rough SiO_2/Si substrate surface created by reactive ion etching;
- Catalyst-free growth of ZnO nanowire networks directly on SiO_2 layer;
- The photoresponse of ZnO nanowire networks .



ZnO nanowire networks

Notes

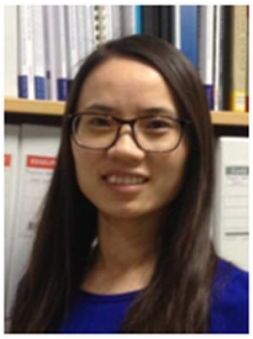
Technical Special Session 11
Surface Analysis and Application of Functional Nano Materials

Room 5

15:50-17:50 Tuesday, 19 July

Organizer: Dan Xia

Co-Chair: Qiang Li

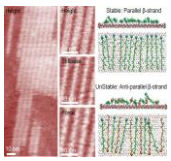


11-1 15:50–16:10

Identification of a Novel Parallel β-stand Conformation within Molecular Monolayer of Amyloid Peptide

Lei Liu
liul@ujs.edu.cn
Institute for Advanced Materials, Jiangsu University, Zhenjiang, 201013, China.

- We investigated the early Aβ33-42 aggregates forming the molecular monolayer at hydrophobic interface;
- The molecular monolayer of amyloid peptide Aβ33-42 consisting of novel parallel β-strand-like;
- The identified parallel β-strand-like structure of molecular monolayer is distinct from the anti-parallel β-strand structure of Aβ33-42 amyloid fibril;
- This finding enriched the molecular structures of amyloid peptide aggregation, which could be closely related to the pathogenesis of amyloid disease.



Notes

11-2 16:10–16:30

Controllable Preparation and Catalysis Performance of CVD-grown Graphene and Its Composite

Baoshan Hu (Ph.D, Associate Prof.)
School of Chemistry and Chemical Engineering, Chongqing University, China

- A new strategy for controlling the graphene layer number is developed;
- The diffusion of C atoms in CVD is H_2-dependent;
- The role of defect in graphene is investigated in Cu_2O/graphene photocatalyst;
- The active N configuration in N-doped graphene for ORR is revealed;
- The paper contributes to the effective control over the graphene structure for modulating its properties and extending its applications as the catalysts.

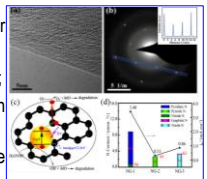


Figure. TEM (a) and SAED patterns (b) of bilayer grahene film; (c) Cu_2O/graphene as photocatalyst; (d) N-doped graphene for catalyzing the oxygen reduction reaction.

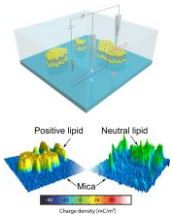
Notes

11-3 16:30–16:50

Surface Charge Density Characterisation with a Scanning Nanopipette

Lasse Hyldgaard Klausen and Mingdong Dong
Interdisciplinary Nanoscience Center (iNANO), Aarhus University, Denmark

- The density and spatial distribution of surface charge is important for micro and nano systems;
- We describe a method capable of mapping surface charge using an electrolyte filled scanning nanopipette;
- The surface charge density of cationic, anionic and zwitterionic lipids is measured;
- Results are verified by finite-element simulations.



Notes

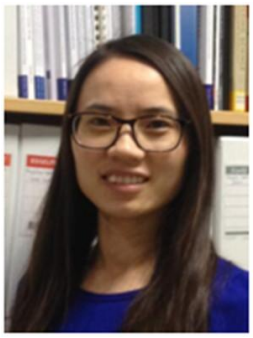
Technical Special Session 11
Surface Analysis and Application of Functional Nano Materials

Room 5

15:50-17:50 Tuesday, 19 July

Organizer: Dan Xia

Co-Chair: Qiang Li



11-4 16:50–17:10

Pulse Evolution in Mid-infrared Femtosecond Optical Parametric Oscillator Based on Silicon-on-insulator Waveguides

Jin, Wen
School of Science, Xi'an Shiyou University, 710065

- The pulse evolution in crystal based on second order nonlinear optical effect has been reported by Reid;
- The circle trip number is 10 when the parametric signals reach stable with the output peak power over 400 W and conversion efficiency over 5%;
- The optical parametric process can generate tunable coherent light in this region, which can give rise to the development of the compact mid-infrared optical source.

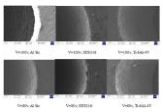
Notes

11-5 17:10–17:30

Investigation of Electro-discharge Micro-machining of AlSiC Alloy

Yiquan Li, Wanwu Hou, Jinkai Xu, Huadong Yu
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
Changchun, Jilin Province, China

- It appears that AlSiC was found to be better capable of producing burr-free and less heat- affected microholes with good surface quality at the rim;
- In case of MRR and EWR, the AlSiC exhibits better than SUS316 and Ti-6-AL-4V;
- It has been concluded from the study that the AlSiC alloy is an ideal material in Micro-EDM drilling process.



Notes

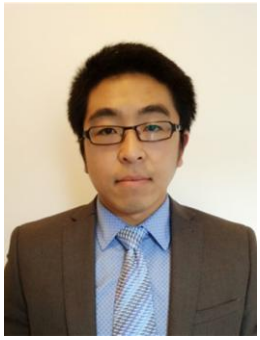
Technical Special Session 12
Plasmonic Nanophotonics and Metamaterials

Room 1

8:00–10:00 Thursday, 21 July

Organizer: Yongkang Gong

Co-Chair: Hua Lu



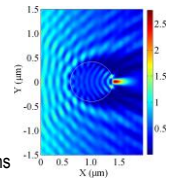
12-1 8:00–8:20

Manipulation of Infrared Light in Graphene Nanostructures

Hua Lu and Jianlin Zhao
School of Science, Northwestern Polytechnical University, China

- Some optical response in graphene nanostructures and related applications are introduced;
- A plasmonic Fano resonance in the nanoscale graphene wave-guided structures is presented;
- A plasmonic nanofocusing effect in graphene is generated by tailoring the dielectric substrate.

Hua Lu conceived the ideas, carried out the simulations and wrote the manuscript. Jianlin Zhao discussed the results and improved the manuscript presentation.



Plasmonic nanofocusing in graphene

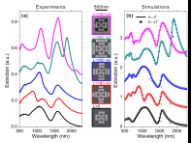
Notes

12-2 8:20–8:40

Enhanced Nonlinear Effect Using Fano Resonances Generated with Plasmonic/Dielectric Nanostructures

Shaoding Liu
Key Lab of Advanced Transducers and Intelligent Control System of Ministry of Education, Taiyuan University of Technology, China
Dangyuan Lei
Department of Applied Physics, The Hong Kong Polytechnic University, China

- Multiple Fano resonances generated with plasmonic nonamers with strong modulation depth;
- Enhanced multiband second-harmonic generation with multimode-matching conditions;
- Fano resonances can also be generated with a symmetric dielectric nanoparticle, which can be used to suppress radiative and nonradiative losses simultaneously;
- Fano resonances with dielectric nanoparticles can be promising for enhanced nonlinear effects.



Multiple Fano resonances generated with plasmonic nonamers

Notes

12-3 8:40–9:00

Light Control due to the Flat Band and Dirac Cone in Artificial Optical Lattices

Yiqi Zhang and Yanpeng Zhang
Department of Electronic Science and Technology, Xi'an Jiaotong University, Xi'an 710049, China
Milivoj Belić
Science Program, Texas A&M University at Qatar, P.O. Box 23874 Doha, Qatar

- We construct novel optical lattices, which possess flat bands and Dirac cones;
- Optical waveguides according to these optical lattices can be prepared by using the femto-second laser writing technique;
- If the light excites the mode of the flat band, the light will be strongly localized during propagation;
- If the light excites the mode of the Dirac cone, it will undergo conical diffraction.

Notes

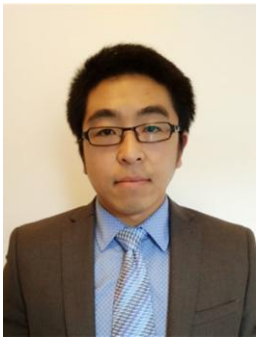
Technical Special Session 12
Plasmonic Nanophotonics and Metamaterials

Room 1

8:00–10:00 Thursday, 21 July

Organizer: Yongkang Gong

Co-Chair: Hua Lu



12-4 9:00–9:20

Manipulation of Light Based on Graphene Plasmons and SOI Waveguide

Guoxi Wang*, Leiran Wang, Wenfu Zhang, Lingxuan Zhang, ZhiqiangGe and Jianwen Liao
State Key Laboratory of Transient Optics and Photonics, Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences, Xi'an, China

- The manipulation of light based on graphene-based self-focus (Selfoc) lens and SOI waveguide;
- Investigate the dispersion of the proposed Selfoc lens;
- The image transfer of two point sources separated by a distance of λ0/30 (λ0 is the incident wavelength in vacuum) can be realized on the graphene;
- This design represents a first step towards mode splitter without changing the mode order.

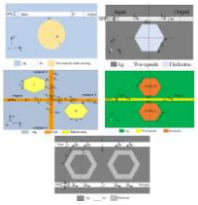
Notes

12-5 9:20–9:40

Novel Functional Devices in MIM Plasmonic Waveguides

Yiyuan Xie
School of Electronics and Information Engineering, Southwest University, China

- High sensitivity plasmonic temperature sensors;
- Triple channel plasmonic wavelength filter;
- Logic device based on plasmon-induced transparency;
- New ideas for designing the plasmonic functional devices;
- Potential applications in optical networks-on-chip.



Schematic diagram of the plasmonic structures

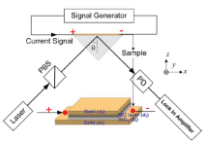
Notes

12-6 9:40–10:00

Novel Free-space Electro-optic Modulator Based on Magnetoplasmonics

Yongkang Gong, Nigel Copner, Kang Li, and Jungang Huang,
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

Technical Special Session 13
Advanced Nano Materials for Semi-conductor Devices

Room 2

8:00–10:00 Thursday, 21 July

Organizer: Shirong Lu

Co-Chair: Dapeng Wei

13-1 8:00–8:20

Flexible Transparent Electrode Based on CuSCN Antireflection Layer for Optoelectronic Devices

Yixiong Ji and Jun Yang

Chongqing Institute of Green Intelligent Technology ,Chinese Academy of Sciences

- Instead of conventional metal oxide or polymer, solution-processed CuSCN was firstly applied as efficient inorganic antireflection layer;
- The flexible transparent electrode showed excellent optical and electric performances;
- Efficient flexible optoelectronic devices (PLEDs and PSCs) based on this novel transparent electrode were developed.

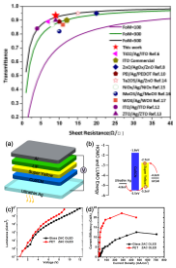


Figure of merits and application in OLED (SY)

Notes

13-2 8:20–8:40

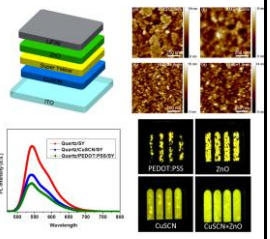
Highly Stable & Efficient Solution-Processed PLED with Synergistic All-Inorganic Transport Layers

Wei Luo, Jun Yang and Chao Zeng

Center for Nanofabrication & System Integration, CIGIT, China

College of Optoelectronic Engineering, Chongqing Univ., China

- Hybrid PLED employing solution-processed all-inorganic transportation layers (TLs) : CuSCN and ZnO nano particles;
- Superior interface properties and optoelectronic characteristics of TLs;
- Synergistic effect on device stability;
- Comparable efficiency with and much higher stability than standard devices.



Notes

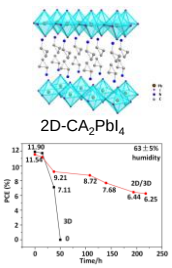
13-3 8:40–9:00

2D/3D Perovskite Hybrids as Moisture-Tolerant and Efficient Light Absorbers for Solar Cells

Chaoyan Ma and Chongqian Leng

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences

- 2D/3D perovskite hybrids were fabricated for the first time in this research;
- 2D/3D perovskite hybrids afforded significantly-improved moisture stability of films and devices without encapsulation;
- 2D/3D perovskite hybrids combine the advantages of long lifetime and high power conversion efficiency;



Notes

Technical Special Session 13
Advanced Nano Materials for Semi-conductor Devices

Room 2

8:00–10:00 Thursday, 21 July

Organizer: Shirong Lu

Co-Chair: Dapeng Wei

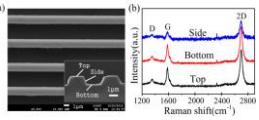
13-4 9:00–9:20

Direct Growth of Conformal Graphene Films on 3D Structural Quartz Substrates (oral)

Xuefen Song and Dapeng Wei*

Key Laboratory of Multi-scale Manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- Direct growth of graphene films on free-catalyst substrates of quartz and silicon;
- Direct growth of conformal graphene films on the substrates with grating and pyramid 3D micro-structures;
- The conformal graphene films possess the sheet resistance of < 2000sq^{-1} and the transmittance of > 80% (at 550nm).



(a) The top surface and cross-section of SEM image, and (b)Raman spectra of the conformal graphene films on the top, side and bottom of micro-grating patterns.

Notes

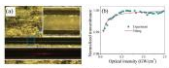
13-5 9:20–9:40

Nonlinear Saturable Absorption of Liquid-exfoliated Transition Metal Dichalcogenides Nanosheets

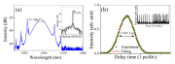
Dong Mao, Bobo Du, Xiaoqi Cui, Mingkun Li, and Tianxian Feng

Shaanxi Key Laboratory of Optical Information Technology, School of Science, Northwestern Polytechnical University, Xi'an 710072, China

Transition metal dichalcogenide (TMD) materials such as MoS_2, WS_2, $MoSe_2$, WSe_2, $MoTe_2$, and WTe_2 have captured tremendous interest for their unique electronic, optical, and chemical properties. The electronic properties vary among TMDs, for example the bandgap decreases as the mass of the chalcogen atom increases (from S to Se to Te). As a result, $MoTe_2$ and WTe_2 have smaller bandgaps and higher conductivity than that of MoS_2 and WS_2. Such near-infrared bandgap is essential for applications of frequency conversion, ultrafast optics, and photo detectors. We have fabricated few-layer TMD nanosheets by a liquid exfoliation method using sodium deoxycholate bile salt as surfactant, and the nonlinear optical properties of the nanosheets are investigated. Our results demonstrate that six types of TMD nanosheets exhibit nonlinear saturable absorption property at 1.55 and 1.064 μm. Soliton mode-locking operations are realized separately in erbium-doped fiber lasers utilizing TMD nanosheets based saturable absorbers, one of which is prepared by depositing the nanosheets on side polished fibers, while the other is fabricated by mixing the nanosheets with polyvinyl alcohol and then evaporating them on substrates. Numerous applications may benefit from the nonlinear saturable absorption features of TMD nanosheets, such as visible/near-infrared pulsed laser, materials processing, optical sensors, and modulators.



Fabrication of saturable absorber based on TMD



Mode-locked soliton pulses

Notes

13-6 Poster 1

High Photoelectrochemical Performance of CdS nanowire-modified 3D Graphene Foam anode (Poster)

Jinpeng Liu and Dapeng Wei*

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences,

Wei Wei*

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

- CdS-modified graphene foam photo-anode was prepared by chemical vapor deposition method;
- The morphology and density of CdS in the composites could be controlled by the deposition time;
- The CdS nanowires makes a major contribution to improving the photo-current density of the anode;
- The photo-current density reaches a high value of 55μA/cm^2 with clear light-on and –off.

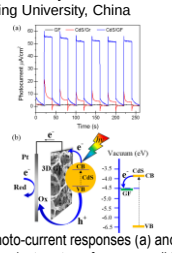


Photo-current responses (a) and the electron-transfer process (b) of the prepared electrodes.

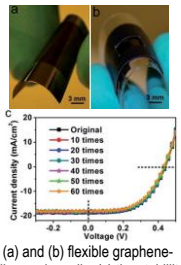
Notes

13-7 Poster 2

Flexible Graphene-Silicon Heterojunction Solar Cells (Poster)

Xiangzhi Liu, Tianpeng Jiao and Dapeng Wei*
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences

- We developed a flexible graphene–silicon (Gr–Si) photovoltaic device with high reliability and stability;
- Ultrathin Si film was fabricated via an anisotropic Si etching method, and exhibited excellent flexibility;
- PMMA film could serve as an antireflection layer that reduces the reflectance from40% to lower than 20%;
- The power conversion efficiency of a PMMA–Gr–Si film solar cell reached 5.09%;
- The PMMA–Gr–Si solar cell could keep 93% of the original efficiency after bending 60 times.



(a) and (b) flexible graphene-silicon solar cells, (c) the stablility of solar cells under bendings.

Notes

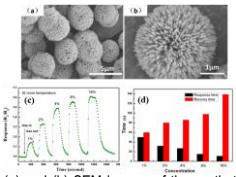
Technical Session 14
Nanofabrication and Nanossembly
Room 3
8:00-10:00 Thursday, 21 July
Chair: Zheng Yang, Co-Chair: Minghui Luo

14-1 8:00–8:20

A Room Temperature Oxygen Gas Sensor Based on Hierarchical TiO_2

Hairong Wang*, Yuqing Yao, Guishan Wu, Qiao Sun, Mengya Wang, Xuyi Luo, Jiuhong Wang
State Key Laboratory for Manufacturing Systems Engineering
Mechanical Engineering School, Xi'an Jiaotong University, China

- The hierarchical TiO_2 was synthesized by hydrothermal process using titanium butoxide, oleic acid and hydrochloric acid;
- The well-defined rutile TiO_2 was confirmed through the characterized of XRD and FESEM;
- The hierarchical TiO_2 have a good reversible sensing capacity to oxygen at room temperature.



(a) and (b) SEM images of the synthetic hierarchical TiO_2;(c).Sensing transients of the TiO_2 to O_2 at room temperature and (d). the corresponding response time and recovery time.

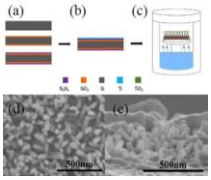
Notes

14-2 8:20–8:40

Facile Preparation of Rutile TiO_2 Nanorod Arrays in a Low HCL Concentration Vapor Environment by AVO Process and Characterizations

Hairong Wang*, Qiao Sun, Guishan Wu, Yuqing Yao, Yang Yu, Yixue Li
State Key Laboratory for Manufacturing Systems Engineering
Mechanical Engineering School, Xi'an Jiaotong University, China

- Oriented rutile TiO2 NRAs prepared by AVO process without using any catalysts, seed or templates;
- The single crystalline of TiO_2 NRAs were tetragonal in shape and grown along the [1 0 1] direction;
- The growth of TiO_2 NRAs controlled by adjusting the growth time and low HCL concentration.



(a)、(b)、(c) schematic illustration of the preparation process of the TiO_2 NRAs ; (d) and (e) side view of the TiO_2 NRAs prepared by AVO at 140 °C with a 1 M HCL solution for 24 h

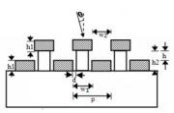
Notes

14-3 8:40–9:00

High-performance Polarizer Based on the Double-layer Metallic Gratings with Air-gaps

Yun Zhou, Su Shen, Yan Ye, Yanhua Liu, Minghui Luo, Linsen Chen
Department Name, University Name, Country College of Physics, Optoelectronics and Energy & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University
Key Lab of Advanced Optical Manufacturing Technologies of Jiangsu Province & Key Lab of Modern Optical Technologies of Education Ministry of China, Soochow University, Suzhou, China

- a high-performance polarizer based on the double-layer Aluminum (Al) gratings with air-gaps;
- the TM transmission efficiency over 80% until the incident angle is 30°;
- At the period of 100 nm, the optimized structure can reach an extinction ratio higher than 30 dB.



The schematic of the double-layer Al gratings with air-gaps

Notes

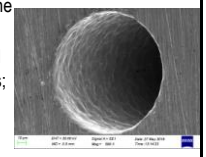
Technical Session 14
Nanofabrication and Nanossembly
Room 3
8:00-10:00 Thursday, 21 July
Chair: Zheng Yang, Co-Chair: Minghui Luo

14-4 9:00–9:20

A Comparative Investigation of Drilling and Milling Micro Holes Using Micro-EDM

Yiquan Li, Wanwu Hou, Jinkai Xu, Huadong Yu
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
Changchun, Jilin Province, China

- The milling process shows better performance for the holes with high depth to diameter ratio;
- Drilling process could gain higher processing speed and better geometrical properties of the micro-holes;
- Rotational speed has a positive impact on the processing speed.



microhole

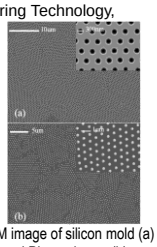
Notes

14-5 9:20–9:40

Silicon-mold-based Fabrication Method for Manufacturing Polyimide Membrane with Nano-Protuberance array

Zheng Yang, Peng Wu, Xianhua Rao, Shaoyun Yin, Chunlei Du
Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, Chongqing China
Chongqing Key Laboratory of Multi-Scale Manufacturing Technology, Chongqing China

- A new method to fabricate PI membrane with nano-protuberance array is proposed;
- The experimental principle for the fabrication method is presented;
- The method is simple and low cost compared to the conventional method;
- The silicon mold and PI membrane with nanostructure are obtained experimentally.



SEM image of silicon mold (a) and PI membrane (b).

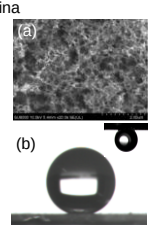
Notes

14-6 9:40–10:00

Rose Petal Mimic Surface By TiO_2 Sol-gel Process

Zhuhui Wu, Zhenwu Shi, Chengyun Xu, Feng Zhang, Liang Gu, Yanyan Wang, Xiaohong Zhou, Changsi Peng
School of Optoelectronics Information Science and Engineering & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, Suzhou, China

- The surface was fabricated by carbon black templated dip-coating of TiO_2 sol-gel;
- The water contact angle of the surface is up to 160°;
- Water droplets could steadily stay on the surface even when the surface is upside down.



(a) SEM image of rose petal mimic surface;(b) the description of surface wettability

Notes

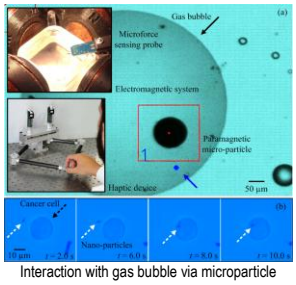
Technical Session 15
Nanophotonics, Nanoparticles and Nanowires
Room 4
8:00-10:00 Thursday, 21 July
Chair: Leiran Wang, Co-Chair: Baiquan Su

15-1 8:00–8:20

Feeling Paramagnetic Micro-Particles Trapped Inside Gas Bubbles: A Tele-Manipulation Study

Islam S. M. Khalil and Youssef Michel (German University in Cairo, Egypt)
Baiquan Su (Bijien University, China)
Sarthak Misra (University of Twente, The Netherlands)

- A scaled bilateral tele-manipulation control system is designed and implemented between a pantograph haptic device and an electromagnetic system;
- The system enables manipulation of gas bubbles via paramagnetic microparticles, while sensing the interaction forces via a haptic device.



Interaction with gas bubble via microparticle

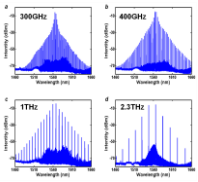
Notes

15-2 8:20–8:40

Recent Progress in Optical Frequency Comb Generation in CMOS-compatible Micro-ring Resonators

Leiran Wang, Weiqiang Wang, Mulong Liu, Guoxi Wang, Xiaohong Hu, Yongkang Gong, Yishan Wang, Wei Zhao, and Wenfu Zhang
State Key Laboratory of Transient Optics and Photonics, Xi'an Institute of Optics and Precision Mechanics of CAS, China

- We demonstrated a novel dual-pump approach for robust infrared OFC generation with tunable FSR spacing;
- The self-locked technique provides good immunity to the thermal or mechanical perturbations.
- On-chip OFC generation at visible green light wavelengths is realized;
- Such approach enables a potential creation of the coherent link between IR and visible wavelengths.



Generated OFC spectra with different frequency spacing (6-, 8-, 20-, and 46-FSR).

Notes

15-3 8:40–9:00

A Novel SERS Substrate Based on Silver Nanoparticles -capsulated Single Porous Glass Microsphere

Xiaoyan Wen[1] and Li Min[5]
School of Science, Wuhan University of Technology, China
Huang Shuai[2]
National Engineering Laboratory for Fiber Optic Sensing Technology, *Wuhan University of Technology, China*
Hanzheng Wang[3] and Hai Xiao[4]
Center for Optical Materials Science and Engineering Technologies (COMSET), Clemson University, USA

- A novel substrate based on silver nanoparticles-capsulated porous glass microsphere (PGM) has been investigated;
- The synthesized substrate was with the advantage of surface-enhanced Raman scattering (SERS);
- With the advantages of Raman enhancement, small size, fabrication convenience and operation flexibility, Ag-capsulated PGM is believed to have considerable application prospect in chemical and biological micro-sensor area.

Notes

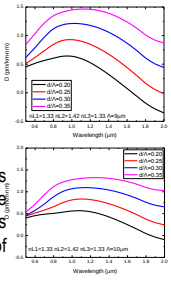
Technical Session 15
Nanophotonics, Nanoparticles and Nanowires
Room 4
8:00-10:00 Thursday, 21 July
Chair: Leiran Wang, Co-Chair: Baiquan Su

15-4 9:00–9:20

Novel Flattened Near-zero Dispersion photonic crystal fibers with selectively material-filled structure

Lijun Xu, Fangzhou Zhao, Xingchen Li, Qingyan Li, Peng Zhang, Xiuping Sun, Zhihai Yao
Changchun University of Science and Technology, China

- The numerical simulation results indicate the values of dispersion increase with the increase of air-hole diameter within the range of 1.35 to 1.95 , the values of dispersion reach the maximum at the wavelength of ~0.8 , then decrease monotonically at the wavelength more than 0.8 .
- The nearly zero flattened dispersion PCF was designed. The simulation result shows that the proposed PCF has achieved the dispersion values as low as 0±0.56 ps/nm.km in the wavelength of 0.5 to 1.2 .



Notes

15-5 9:20–9:40

Recent Progress of Synthesis for Magnetic Nanoparticles and Its Application in Biomedicine

Jie Wu, Haining Ji, Yinchun He,Handong Li
Chaoqun Shen, Desheng Liu
State Key Laboratory of Electronic Thin Film and Integrated Devices, University of Electronic Science and Technology of China, China
Shafa Muhammad and Eric Ashalley
Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China

- This paper presents the synthetic method and surface modification materials for obtaining the magnetic nanoparticles (MNPs) suitable for biomedical application. Finally, the progress of MNPs in biomedicine such as MRI, bioseparation are discussed. A number of effective strategies have so far been examined to enhance the performance of MNPs in the related biomedical application.

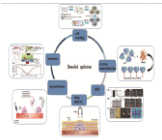


Figure 1 the application of MNPs for biomedical application

Notes

15-6 9:40–10:00

Research on a New Wire Feeder with Automatic Brake Function

Demin Wang, Jian Zhang, Huadong Yu
College of Electro-mechanical
Changchun University of Science and Technology

- Polygonal reinforcing cage seam welder which has been widely used in many large projects is a high efficiency, high quality, high-technology construction equipment;
- In the polygonal reinforcing cage seam welder design and development process, according to the design requirements, it is necessary to design a new wire feeder to transport rebars to the polygonal reinforcing cage seam welder to weld reinforcing cage;
- Other wire feeders brake the material salver by adopt cylinder to push the brake pads to rub the principal axis. However, the braking time of this method is too long and the brake effectiveness is pretty poor.

Notes

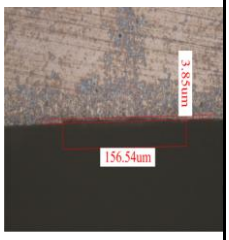
Technical Session 16
Nanomechanics and Nanomechatronics
Room 5
8:00-10:00 Thursday, 21 July
Chair: Huawei Chen , Co-Chair: Shuhua Wei

16-1 8:00–8:20

Experimental Study on Tool Wear Mechanism of TC4 Titanium Alloy by Laser Assisted Cutting

Jinkai Xu, Zhe Xu, Qiang Du
,Xuefeng Li ,Zhichao Wang, Chuanpeng Chu ,Huadong Yu
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
China

- TC4 titanium alloy;
- The method of laser assisted machining;
- Tool wear form.



P=15w section of flank face

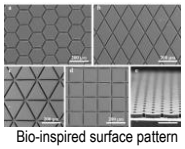
Notes

16-2 8:20–8:40

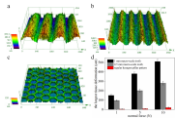
Surface Function Mechanism of Biological Surfaces and Bio-inspired Medical Devices

Huawei Chen, Liwen Zhang, Pengfei Zhang and Deyuan Zhang
School of Mechanical Engineering and Automation, Beihang University, China

- Anti-adhesion and anti-slipping are demanded for surgical performance to reduce soft tissue damage;
- Unidirectional water transport on peristome of *Nepenthes* was discovered for anti-adhesion;
- Wet friction mechanism of tree frog toe pad was investigated for design of bio-inspired grasper;
- Bio-inspired medical devices were developed to avoid soft tissue damage in surgical performance.



Bio-inspired surface pattern



Soft tissue damage

Notes

16-3 8:40–9:00

Mechanism and Application of Capillary-force Self-assembly Micro/nanofabrication

Shuhua Wei*, Minglong Qin, Jing Zhang
* Department of Microelectronics, Institute of Electronic Information Engineering
North China University of Technology

- Research on the mechanism of capillary-force self-assembly and the impact factors of nanostructures suffered by capillary-force;
- Classified the main assembly methods and geometries based on capillary-force self-assembly, and analyzed its characteristics and limitations;
- Put forward some problems that need to be solved and proposed a new concept of programmable capillary-force self-assembly to achieve a reliable control of capillary-force.

Complex CNT microarchitectures and multi-directional patterns created by coupling elementary catalyst shape building blocks.

Notes

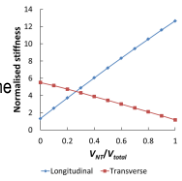
Technical Session 16
Nanomechanics and Nanomechatronics
Room 5
8:00-10:00 Thursday, 21 July
Chair: Huawei Chen , Co-Chair: Shuhua Wei

16-4 9:00–9:20

Mechanical Properties of Unidirectional Nanotube and Nanoplatelet Reinforced Hybrid Epoxy Nanocomposites

Chensong Dong
Department of Mechanical Engineering, Curtin University, Australia

- A theoretical study on the stiffness of nanotube and nanoplatelet reinforced hybrid nanocomposites is presented;
- The stiffness increases with the reinforcement volume content;
- It is possible to achieve in-plane isotropy via hybridisation.



Normalized stiffness of nanocomposites containing 5% v/v reinforcement

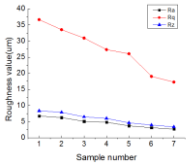
Notes

16-5 9:20–9:40

Experimental Study on the Oxide Film of 1060 Aluminum by Using

Dongjie Cheng, Guangfeng Shi,
Guoquan Shi, Zhe Xu, Keke Zhu
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
China

- 1060Al;
- WEDS-HS;
- oxide films;
- Phase composition, Morphology ,Roughness.



Roughness values of oxide film under different pulse width

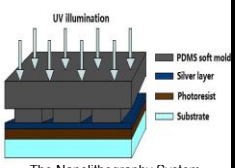
Notes

16-6 Poster 1

Superresolution Nanolithography Technique Based on PDMS Soft Mold

Chuanwang He, Xiaochun Dong
The Institute of Optics and Electronics, Chinese Academy of Sciences, China

- The proposed SPs nanolithography system: PDMS soft mold, silver layer, photoresist and substrate.
- By adjusting the linewidth, we achieved the different nanometer electric field distributions.
- We get the highest contrast of the electric field distributions by adjusting the thickness of the silver layer.
- The feature size far beyond the diffraction limit , smaller than 1/10 operating wavelength.



The Nanolithography System

Notes

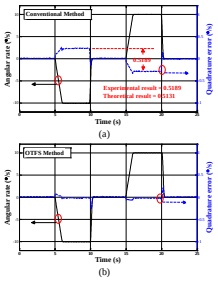
Technical Session 17
NEMS and Their Applications
Room 6
8:00-10:00 Thursday, 21 July
Chair: Han Wang , Co-Chair: Wei Ma

17-1 8:00–8:20

One-time Frequency Sweep to Eliminate IQ Coupling in MEMS Vibratory Gyroscopes

Wei Ma, Siqi Liu, Yiyu Lin, Yidong Liu, Zhonghe Jin
Micro-satellite Research Center, Zhejiang University, Hangzhou, P.R. China

- The impact of electric phase delay on the IQ coupling characteristics in micro-gyroscopes is studied;
- Theoretical analysis derives an analytical equation of the IQ coupling about the phase error;
- A one-time frequency sweep (OTFS) procedure is proposed to compensate for the phase error;
- Experimental results show that the OTFS method greatly eliminates the unwanted IQ coupling.



The proposed OTFS method greatly eliminates the wanted IQ coupling.

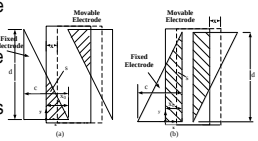
Notes

17-2 8:20–8:40

A New Type of MEMS Accelerometer with Up-tuning Structure

Yixuan Guo, Zhonghe Jin, Jiehui Du, Yidong Liu
Micro-Satellite Research Center, Zhejiang University, Hangzhou, P.R.China

- Up-tuning effect can greatly solve the problem and harden the spring of the beam;
- Theoretical design and working principle of tuning structure are presented;
- Fabrication process and parameters is illustrated;
- The equivalent spring constant can be tuned from 65N/m to 72N/m and the linearity of the new type of MEMS accelerometer with up-tuning structure can reach 99.9865%.



The plane schematic view and movement of the MEMS accelerometer's tuning triangular electrodes

Notes

17-3 8:40–9:00

Mems-based Semi-packed Gas Chromatography Column with Wavy Channel Configuration

Huan Yuan, Xiaosong Du, Yi Li and Yadong Jiang
State Key Laboratory of Electronic Thin Films and Integrated Devices, University Of Electronic Science And Technology Of China, China

- The wavy microcolumn embedded circular posts is made by deep reactive-ion etching technology;
- The arrangement position, shape, size of embedded posts in the column are explored by the finite element method;
- The microcolumn is used to separate normal alkanes from C5 to C12 to test its performance.

optical microscopy image of the gas chromatography column

Notes

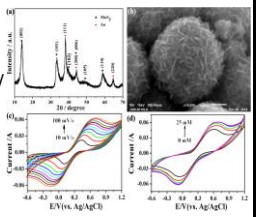
Technical Session 17
NEMS and Their Applications
Room 6
8:00-10:00 Thursday, 21 July
Chair: Han Wang, Co-Chair: Wei Ma

17-4 9:00–9:20

Preparation of Au-MoS_2 Electrochemical Electrode and Investigation on Glucose Detection Characteristics

Yingjiao Zhai, Jinhua Li*, Xueying Chu, Mingze Xu, and Fangjun Jin
School of Science, Changchun University of Science and Technology ,China
Xuan Fang, Zhipeng Wei, and Xiaohua Wang
State key laboratory of high power semiconductor laser,Changchun University of Science and Technology ,China

- Microflowers-like Au-MoS_2 non-enzymatic glucose biosensor was fabricated;
- High electrocatalytic activity with a sensitivity of 932 μA mM^{-1};
- A good linear relationship was obtained with the correlation coefficient (R) of 0.9708.



Notes

17-5 9:20–9:40

The Direction and Stability Control System for Near-Field Electrospinning Direct-Writing Technology

Jun Zeng, Xin Chen, Han Wang *, Peixuan Wu
Guangdong Provincial Key Laboratory of Micro-Nano Manufacturing Technology and Equipment, Guangdong University of Technology, Guangzhou,China

- Investigated the instability of the whip in the printing process;
- Presented an automatic monitoring and feeding back system;
- Improving the printing process of the stability and reliability in the production.

Electrospinning motion platform overall structure diagram

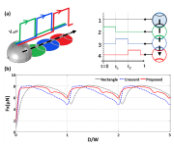
Notes

17-6 Poster 1

An Improved Crescent Electrode in Electrowetting-based Microfluidic

Hongli Jin
School of Electronic Information Engineering, Beihang University, China

- Propose an improved crescent electrode and is proved by calculating the driving force of droplet;
- Increase the minimum Fx of the droplet continuous movement;
- Decrease the standard deviation of Fx of the dropletcontinuous movement;
- Provide the same diving performance in the movement of the droplet in two directions.



(a)Energizing sequence
(b)Actuation force in x-direction

Notes

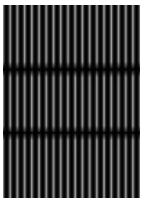
Technical Session 17
NEMS and their applications
Room 6
8:00-10:00 Thursday, 21 July
Chair: Han Wang, Co-Chair: Wei Ma

17-7 Poster 2

A Gray Matching Method for Cylindrical Lens Array Fabrication Based on DMD Lithography

Hengxu Zhang and Zhe Li
School of OptoElectronic Engineering
Changchun University of Science and Technology
China

- Maskless lithography technology which is based on DMD;
- The phenomenon of dislocation and truncation often occur in the process of graphic matching;
- The gray gradient mask of three-dimensional structure should be designed ;
- Designed grayscale mask can eliminate the influence in the overlapping part of the graphics matching.



Cylindrical lens array gray mask

Notes

Technical Special Session 18
Machining and Characterization of Multi-scale Micro/Manostructured Functional Surfaces

Room 1

10:20-12:20 Thursday, 21 July

Organizer: Mingjun Ren

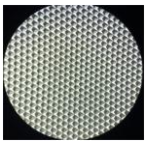
Co-Organizer: Zhiwei Zhu

18-1 10:20–10:40

Design and Manufacturing of Functional Microstructured Surfaces

LingBao Kong, ZhenZhen Xu and PanYu Zhou
School of Information Science and Technology, Fudan University, China

- Applications of various functional microstructured surfaces are studied;
- Different functional microstructured surfaces are designed for particular applications;
- Manufacturing approaches of these designed microstructured surfaces are investigated;
- Research problems are pointed out and studied during ultra-precision machining of microstructures.



TR Microstructures

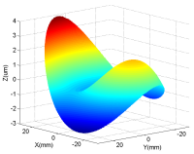
Notes

18-2 10:40–11:00

Advances in Ultraprecision Machining for Freeform Optics

Pengzi Xu and Qiang Liu
School of Mechanical Science and Engineering, Jilin University, Changchun 130022, China

- Introduce definitions, advantages, mathematical description and engineering applications for freeform optical surfaces;
- Review of fast tool servo and associated fundamental techniques in terms of toolpath generation and surface topography modeling for freeform optics turning;
- Review of state-of-the-art techniques for surface finishing, including bonnet polishing, MR polishing and belt polishing.



An example of freeform surface

Notes

18-3 11:00–11:20

Structural Coloration of Metallic Surfaces Using Elliptical Vibration Texturing

Yang Yang and Ping Guo
Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Hong Kong

- Proposed a structural coloration method using elliptical vibration texturing;
- Created regular micro/nano-ripples utilizing ultrasonic vibration of the cutting tool;
- Achieved controlled iridescent effects by adjusting the nano/micro-ripple spacing.

Vivid colorful patterns created by a stepped velocity profile

Notes

Technical Special Session 18
Machining and Characterization of Multi-scale Micro/Manostructured Functional Surfaces

Room 1

10:20-12:20 Thursday, 21 July

Organizer: Mingjun Ren

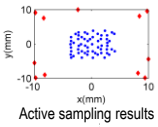
Co-Organizer: Zhiwei Zhu

18-4 11:20–11:40

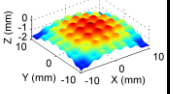
Measurement and Characterization of Multi-scale Complex Surfaces Using Gaussian Process Model

Mingjun Ren, Lijian Sun and Yuehong Yin
Insitute of Robotics, Shanghai Jiao Tong University, China

- Gaussian process based Bayesian inference method is presented to model the multi-scale surfaces;
- Composite kernel functions are proposed to describe the spatial relationship of the discrete points;
- The covariance is used as critical criterion to perform active data sampling and multi-sensor data fusion;
- The statistical nature of the Gaussian process makes the method generic for different kinds of surfaces.



Active sampling results



Established GP model

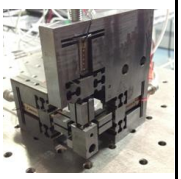
Notes

18-5 11:40–12:00

A Piezo-actuated Compliant 3-DoF Nano-tooling for Micro/nanomachining

Zhiwei Zhu and Sandy To
State Key Laboratory of Ultra-precision Machining Technology, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Kowloon, Hong Kong SAR, China

- A 3-DoF nano-tooling system using three orthogonal piezo-actuators is developed for micro/nanomachining;
- A multi-objective algorithm using Pareto optimal frontier is developed to analytically optimize the mechanical structure;
- Finite element analysis and experimental tests are conducted to investigate its working performance as well as to demonstrate the design process.



Photograph of the 3-DoF nano-tooling

Notes

Technic Session 19
Nanohandling Robots and Systems
Room 2
10:20-12:20 Thursday, 21 July
Chair: Xugang Feng, Co-Chair: Yan Liu

19-1 10:20–10:40

Tracking Control with Several New Control Methods for Different Kinds of Linear or Approach Linear

Xianqiang Zhang,
School of Automation Science and Engineering South China University of Technology, Guangzhou 510641 China
John.T. W. Yeow
Systems Design Engineering University of Waterloo, Waterloo N2L3G1, Canada

- This paper presents several new control methods;
- ST-ER control and ST-ER-DE control are designed to control different kinds of precise linear systems;
- GAST-ER control and GAST-ER-DE are robust control methods which can track different kinds linear systems or approach linear systems even when there is little or no information available regarding plant dynamics;
- Those control methods don't need the state equation of system and internal model principle, their implemention are simple, their tracking performance are perfect.

Notes

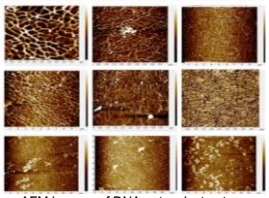
19-2 10:40–11 :00

DNA Network Structures Induced by Ferric Ions on Mica Surfaces

Lu Zhao, Wenxiao Zhang, Ying Wang, Xinyue Wang, Fenfen Guo, Zuobin Wang*

JR3CN & CNM, Changchun University of Science and Technology, China

- DNA imaged by atomic force microscopy;
- Ferric ions can induce DNA well adsorption on mica surfaces;
- The range of DNA network structure induced by ferric ions is 200-280ng/ul.



AFM images of DNA network structure (concentration range of solution is 200-280ng/ul)

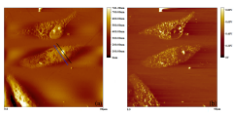
Notes

19-3 11:00–11:20

Quantitative Imaging and Analysis of SMCC－7721 Cells Using AFAM

Yan Liu, Zuobin Wang,Yujing Zhao and Xinyue Wang
CNM, Changchun University of Science and Technology, China
Yang Yang
College of Mechanical Science and Engineering, Jilin University, China

- Quantitative the morphological and subsurface elasticity changes of the cells using atomic force acoustic microscope;
- The imaging results were the SMCC-7721 cells treated with 4% paraformaldehyde, and untreated and treated with Thymidine;
- The AFAM is a useful tool to measure the surface, intracellular structure and the elasticity property of the cells.



The AFAM images of SMCC-7721 cells

Notes

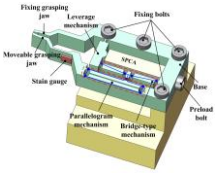
Technic Session 19
Nanohandling Robots and Systems
Room 2
10:20-12:20 Thursday, 21 July
Chair: Xugang Feng, Co-Chair: Yan Liu

19-4 11:20–11:40

Design of a Novel Asymmetrical Piezoelectric Actuated Microgripper for Micromanipulation

Cunman Liang, Fujun Wang, Yanling Tian, Dawei Zhang
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, China

- A novel asymmetrical piezoelectric actuated microgripper is designed;
- Pseudo-rigid-body (PRB) model is employed to conduct the kinematic, static and dynamic modeling of the microgripper;
- Finite element analysis (FEA) is conducted to evaluate the characteristics of the microgripper.



The mechanism of the developed asymmetrical microgripper

Notes

19-5 11:40–12:00

The Study on Error Compensation of the Probe System for Nano Coordinate Measuring Machine

Du Cuicui, Feng Xugang, Li Xinguang, Zhang Jiayan
Institute of electrical and information engineering, Anhui University of Technology,China

- Analyze the source of the dynamic error system and the influencing factors for Nano-CMM;
- Propose the method, which is composed of dynamic calibration of probe radius and micro-plan compensation;
- In order to prove the effectiveness of the method, measure the outline of a concave wheel;
- Analyze the experimental results and gain the conclusion.

Notes

19-6 Poster 1

Label-free Detection of Protein using Terahertz Bio-sensing Based on a Metamaterial

Shihan Yan, Liangping Xia and Dongshan Wei
Chongqing Key laboratory of Multi-Scale manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, CAS, China

- There were multi resonant frequencies to help determine protein characteristic;
- The minimum detection limit was varying concentrations of rat IgG as low as ~0.001mg/Ml;
- Interacting proteins had relatively larger variation of the resonant frequency;
- It was a potential new method for Label-free detection of protein.

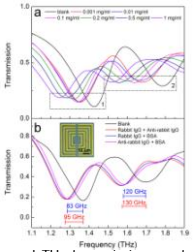


Figure. Measured THz transmission spectra of the biosensor with (a) IgG solutions of different concentrations, (b) different protein solution mixture.

Notes

Technical Session 20

Graphene and Applications

Room 3

10:20-12:20 Thursday, 21 July

Chair: Dongshan Wei, Co-Chair: Xin Zhang

20-1 10:20–10:40

Various Patterns Made by Interference of Surface Waves

Gaofeng Liang and Qing Zhao
School of Physical Electronics,
University of Electronic Science and Technology of ChinaUniversity, China

- Surface waves interference can produce periodic, quasi-periodic, and non-periodic pattern;
- The period of the interference patterns is deeply related to the included angle and diffraction order;
- Various interference patterns can be generated by manipulate the number of surface waves;
- Plenty of surface waves will lead to a pattern with many concentric rings.

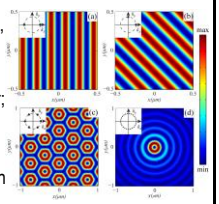


Figure: Field distribution formed by 2 SWs (a, b), 6 SWs (c), and 36 SWs (d) interfering, respectively.

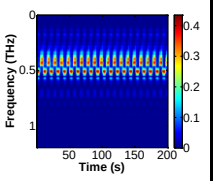
Notes

20-2 10:40–11:00

Terahertz Amplitude Modulator with Graphene Based Metasurface

Xin Zhang, Liangping Xia*, Ziyin Zhang, Xinqun Zhang, Dongshan Wei*, Changbin Nie, Hongliang Cui, Chunlei Du
Key Laboratory of Multi-scale Manufacturing Technology, Chongqing institute of green and intelligent technology, Chinese Academy of Sciences, Chongqing, 400714, China

- The terahertz amplitude modulator consists of a single-layer graphene and subwavelength metal structure surface (SMSS);
- Graphene is core regulatory elements which controls the terahertz wave;
- SMMS plays a role of frequency selection;
- The terahertz amplitude modulator was realized and use to modulate the amplitude of terahertz wave, the modulation depth is over 50% at 0.5THz when bias voltage varies from 0V to 20V in the experiment.



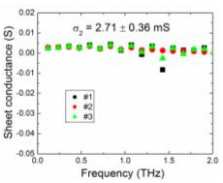
Notes

20-3 11:00–11:20

Sheet Conductance and Imaging of graphene by Terahertz Time-Domain Spectroscopy

Shihan Yan, Zhancheng Li , Dongshan Wei*
Chongqing Key Laboratory of Multi-scale Manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, Chongqing, 400714, China

- Terahertz time-domain signals of Si and graphene on Si were measured by THz-TDS;
- Conductance of graphene was derived from Fresnel coefficient and Tinkham film equation;
- Sheet conductance of graphene by THz-TDS was in good agreement with four-probe and eddy current tests;
- THz conductance imaging was realized and used to monitor the quality of graphene.



Notes

Technical Session 20

Graphene and Applications

Room 3

10:20-12:20 Thursday, 21 July

Chair: Dongshan Wei, Co-Chair: Xin Zhang

20-4 11:20–11:40

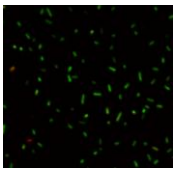
Interrogate the Antibacterial Activities of Nano Graphene Oxide Sheets

Huabin Wang

Chongqing Institute of Green and Intelligent Technology , Chinese Academy of Sciences, China

School of Chemistry , University of Melbourne, Australia

- A brief introduction of nano graphene oxide (GO) sheet and its antibacterial activities;
- Investigation on the effect of GO sheets on the viability of wild-type *K. pneumoniae* bacteria;
- Investigation on the effect of GO sheets on the viability of capsule-deficient *K. pneumoniae* bacteria;
- Discussions and conclusion.
- Contact: wanghuabin@cigit.ac.cn



A confocal microscopy image of bacteria treated with GO sheets

Notes

20-5 Poster 1

Preparation and Characterization of graphene oxide/ carbon nanotubes films

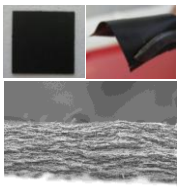
Xiao Wang, Yiwei Ren

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

Mo Song, Suaad Alsawafi, Jie Jin

Department of Materials, Loughborough University, United Kingdom

- A series of graphene oxide /carbon nanotubes films are prepared by solution casting method;
- The films process layer-by-layer structure;
- The films show excellent capacitance;
- It contributes to the development of a new type of capacitor.



Notes

Technical Session 21
Nanometrology and Nanocharacterization
Room 4
10:20-12:20 Thursday, 21 July
Chair: Mingkun Zhang, Co-Chair: Wei He

21-1 10:20–10:40

Study on Surface Quality in Micro Milling Stainless Steel 06Cr17Ni12Mo2 Processing

Huadong Yu, Haoteng Yuan, Jinkai Xu,
Wanwu Hou, Yun Qi
College of Mechanical and Electric Engineering
Changchun University of Science and Technology

- Surface roughness is one of the important indexes to measure surface quality;
- Micro milling parameters are important to reduce the surface roughness and improve the surface quality;
- Reasonable process parameters are essential for the suppression of the formation of burrs.

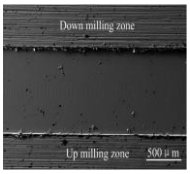


Figure surface morphology of the bottom groove

Notes

21-2 10:40–11:00

The Electrical Characterizations of Multi-quantum Well Material for Infrared Detection

Wei He, Tong Zhou, Bo Jiang, Yin Wan, and Yan Su
School of Mechanical Engineering
, Nanjing University of Science and Technology, China
Mincong Lu
Nanjing Foreign Language School, China

- This paper mainly introduced a new method for testing the Temperature Coefficient of Resistance(TCR) of multi-quantum well material in order to evaluating whether the material confirms the requirements for the fabrication of micro bolometer pixels. This paper mainly contains the following four points:
- The fabrication of TCR tester structure;
- The building of electrical characterizations testing system;
- The results and discussion;
- The conclusion.

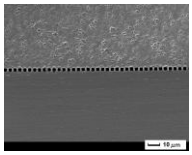
Notes

21-3 11:00–11:20

The Properties, Preparation Approaches and Uses of Microfluidic Channels for Terahertz Absorption Signatures Detection in Aqueous

Zhang Mingkun and Wei Dongshan
Chongqing Key Laboratory of Multi-scale Manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

- Thousands of rectangular microchannels with a characteristic dimension of 2 μm and their reservoirs were precisely etched in a high resistivity silicon wafer, then the silicon wafer and a glass sheet were bonded to form a sealed microfluidic chip;
- Three absorption signatures around 850, 928, 950 GHz of dissolved λ-DNA were obtained in 0.7~1.0 THz band by using this chip and the coherent photomixing spectrometer.



The SEM end view of 2 μm spacing microchannels fluidic chip, which are etched on silicon substrate and bonded with glass film

Notes

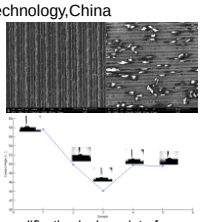
Technical Session 21
Nanometrology and Nanocharacterization
Room 4
10:20-12:20 Thursday, 21 July
Chair: Mingkun Zhang, Co-Chair: Wei He

21-4 11:20–11:40

Ti-6Al-4V Alloy Modification by Laser Interference Lithography

Qi Liu, Wenjun Li, Liang Cao, Jiajia Wang, Yingmin Qu, Xinyue Wang, Jin Yan, Xu Di, Zuobin Wang*
JR3CN & CNM, Changchun University of Science and Technology, China
Bojian Liang
China-Japan Union Hospital, Jilin University, China
Rongxian Qiu
Changchun University of Science and Technology,China

- Two-beam laser interference was used to pattern Ti-6Al-4V alloy for the fabrication of groove structure;
- The surface roughness and wettability were increased after LIL treatment;
- The SEM images showed groove structures promote cells grow align in the direction of the grooves to avoid scar tissue formation.



Ti-6Al-4V alloy modification by laser interference lithography

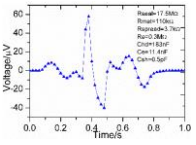
Notes

21-5 11:40–12:00

Simulation analysis of coupling characteristics between cardiac myocyte and microelectrode arrays

Li Zhao, Zhengxun Song*, Zuobin Wang, Siwei Zhang, Jin Yan and Nan Zhang
JR3CN & CNM, Changchun University of Science and Technology, China

- The equivalent circuit model of between cardiac myocyte and microelectrode was used to study the factor influencing APs measurement.
- The improved methods for the parameter that influences on the signal measurement greatly were was given and the dialectical relationship between parameters was analyzed.
- The experimental results showed that only some parameters have heavily influence on the APs measurement.



Simulation analysis of coupling characteristics between cardiac myocyte and microelectrode arrays

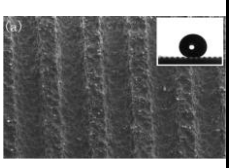
Notes

21-6 12:00–12:20

Effect of Micro-groove Size on The Hydrophobicity of Aluminum Surface

Yanling Wan, Bin Dong, Lining Xu, Jinkai Xu, Huadong Yu, Zhanjiang Yu
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
Changchun, Jilin Province, China

- The micro-groove structure was fabricated on the aluminum surface by high speed wire cutting discharge machine (HS-WEDM);
- Orthogonal design was using to analyze the relationship between the size of micro structure and the wettability of materials;
- Discussed the wetting mechanism of the specimen.



(a) SEM photograph after processing

Notes

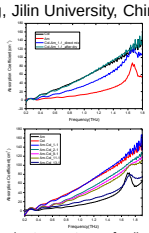
Technical Session 21
Nanometrology and Nanocharacterization
Room 4
10:20-12:20 Thursday, 21 July
Chair: Mingkun Zhang, Co-Chair: Wei He

21-7 Poster 1

Characterization of Glucosamine and Collagen Crystallization by Terahertz Time-Domain Spectroscopy

Changcheng Shi, Dongshan Wei, Chunlei Du and Hongliang Cui
Research Cent. for THz Tech., Chongqing Key Lab of Multi-scale Manufacturing Tech., CIGIT, CAS, China
Yuting Ma
College of Instrumentation and Electrical Engineering, Jilin University, China

- Pure glucosamine pellet has a clear absorption peak around 1.7THz, indicating the crystal formation;
- Pure collagen pellet has a featureless spectrum within 0.2THz ~ 1.8THz due to its amorphous nature;
- The absence of THz absorption peak indicates less crystal growth in collagen-glucosamine (1:1) mixture;
- The recurrence of THz absorption peak indicates the crystal growth in collagen-glucosamine (1:13) mixture.



Terahertz spectrum of collagen and glucosamine

Notes

Technical Session 22
Nanofabrication and Nanocharacterization

Room 5

10:20-12:20 Thursday, 21 July

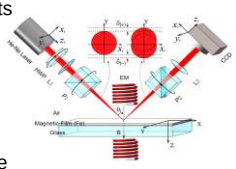
Chair: Xiaodong Qiu, Co-Chair: Zhiyong Guo

22-1 10:20–10:40

Precision Metrology with Weak Measurements using Spin Hall Effect of Light

Xiaodong Qiu, Linguo Xie, and Zhiyou Zhang
College of Physical Science and Technology, Sichuan University, China

- Here, we will review some of our works on precision with weak measurements using spin Hall effect of light;
- Determination of magneto-optical constant of magnetic film;
- Measurement of the beam waist of light;
- Measurement of the polarization state of light.



Experimental setup for magneto-optical constant measurement.

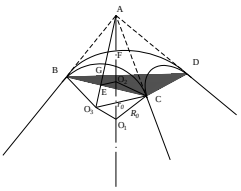
Notes

22-2 10:40–11:00

Tip Modeling of a Probe for Nanochannel Fabrication

Zhiyong Guo, Yanling Tian, Chongkai Zhou, Dawei Zhang
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, China

- A sphere tipped regular triangular pyramidal tip model is presented;
- The horizontal projected area of tip-sample interface is theoretically analyzed in both single and multi scratching;
- In the scratching of the pyramidal tip model, the effect of the scratching direction to the horizontal projected area of tip-sample interface is analyzed.



The sphere tipped regular triangular pyramidal tip model

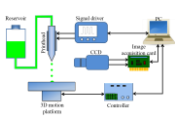
Notes

22-3 11:00–11:20

Development of a Droplet Generation Equipment for Nano Carbon Thin Films Printing

Hongcheng Lian, Jun Luo, Xianming Zhang, Lehua Qi*
School of Mechatronic, Northwestern Polytechnical University, China
Huaiyuan Qu
School of Material, Northwestern Polytechnical University, China

- Develop a DOD droplet generator and uniform droplet spraying equipment for films printing;
- Design an interchangeable nozzle for nozzle easy cleaning and changing;
- Prepare uniform nano carbon thin films;
- Propose a low-cost and fast method to prepare nano carbon thin films.



Schematic diagram of the integrated nano carbon uniform droplet spraying equipment

Notes

Technical Session 22
Nanofabrication and Nanocharacterization
Room 5
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Chair: Xiaodong Qiu, Co-Chair: Zhiyong Guo

22-4 11:20–11:40

Synthesis of Ag-coated Cu nano powder applied to the silver paste on front of the solar cell

HuangXia
Micronano electronic Department , Shanghai jiaotong University , China
LiuYijian
Micronano electronic Department , Shanghai jiaotong University , China

Abstract

- 1.Method ：glucose pre-reduction – direct replacement
- 2.Measure： X-ray photo electron spectroscopy (XPS), X-ray fluorescence (XRF), X-ray diffraction (XRD) and scanning electron microscopy(SEM)
- 3.Signicance：largely decrease the price of solar cell (about 40%)

Notes

22-5 11:40–12:00

Dynamic Analysis of The Micro-milling System Based on ANSYS Workbench

Jinkai Xu, Zenghui Ren, Huanhuan Ren,
Huadong Yu,Zhanjiang Yu
Changchun University of Science and Technology
College of Mechanical and Electric Engineering
Changchun, Jinlin Province, China

- The static stiffness of the mirco-milling system is suitable for mirco-milling;
- 300Hz causes the largest amount of too deformation,the work speed is not the corresponding speed;
- We find out several ways to improving the stiffness.

Figure harmonic response of micro-milling system

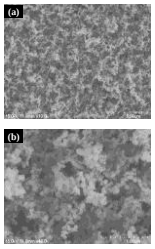
Notes

22-6 12:00–12:20

Fabrication of Superhydrophobic Soot-like Surface

Chengyun Xu[1], Zhenwu Shi[1,*], Zhuhui Wu[1], Feng Zhang[1], Liang Gu[1], Yanyan Wang[1], Xiaohong Zhou,Changsi Peng[1,2,#]
[1]School of Optoelectronics Information Science and Engineering & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, Suzhou 215123, China
[2]Hanna Sci-Tech Co, Ltd, Changzhou, China

- Candle soot is natural supehydrophobic material;
- PDMS has excellent mechanical strength;
- We combine candle soot and PDMS to get superhydrophobic surface.



SEM images of candle soot at amplification of 10k (a) and 40k (b)

Notes

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22-7 Poster 1

Terahertz Filter Based on Multi-layered Metamaterials

Xinqun Zhang, Liangping Xia*, Ziyin Zhang, Xin Zhang, Guozhong Zhao*, Dongshan Wei, Hongliang Cui, Chunlei Du
Key Laboratory of Multi-scale Manufacturing Technology, Chongqing institute of green and intelligent technology, Chinese Academy of Sciences, Chongqing, 400714, China

- Terahertz metamaterials was manufactured by wet etching in the process of lithography.
- The preparation of multi-layer samples was made by using negative photoresist as isolation layer.
- Negative photoresist is cheap, thickness control, flexible operation.
- Compared with single-layer metamaterials, multi-layer metamaterials are broadband filtering, filtering rising edge steepness increases and other advantages.

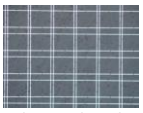


Fig.1 Microscope photos of sample

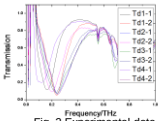


Fig. 2 Experimental data

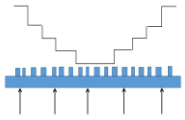
Notes

22-8 Poster 2

A Manufacturing Method of Achromatic Focus Metasurface

Zhe Li and Hengxu Zhang
School of OptoElectronic Engineering,Changchun University of Science and Technology,China

- This metasurface is fabricated by silicon with germanium substrate working on far-infrared;
- The metasurface includes a series of dielectric antennas which can make phase shift for light;
- Designed antennas shape the plane wave to gradient spherical wave on working wavelength;
- For the accurate size we use electron-beam lithography and Vacuum magnetron sputterring deposition method.



Phase shift gradient produced by metasurface

Notes

General Information

Chongqing, a fascinating city

Only four Chinese cities are highlighted on the world map hanging in The United Nations General Assembly Hall. Chongqing is one of them.

Chongqing, an open inland city, is built on mountains and embraced by the Yangtze River and Jialing River.

Chongqing is situated in southwest China, the upper Yangtze River, with its city proper as a peninsula surrounded by rivers from three sides and boasting gorgeous mountains and rivers structuring together. A city landscape full of hills and water, skyscraping buildings and lush mountain forests constitute this world's only large forest city which is harmonious with nature and has unique influence.

Chongqing can be the third largest city in the total population. Such two parts as the city center and the whole metropolitan region will be concerned for the total population calculation of Chongqing. And the population of the whole Chongqing metropolitan region is up to 32.57 million, following Tokyo and Mexico City only.

Chongqing was called Jiang Prefecture in ancient times, and was established as Ba Prefecture in Han Dynasty. Ba Prefecture was renamed as Chu Prefecture during the Southern and Northern Dynasties and as Yu Prefecture in 581 A.D. by Emperor Wen of Sui Dynasty, and since then, Chongqing has been known as Yu for short.In 1189, Emperor Guangzong of Song Dynasty ascended the throne after he was titled Prince Gong. Delighted by this "double happiness", he promoted Gong Prefecture to Chongqing Fu. That is how the city got its present name Chongqing more than 800 years ago.

The charm of Chongqing lies in its culture and spirit, which are the city's "root and soul". Since ancient times, Bayu culture has given birth to incomparably glorious civilization. This is a city of heroes, its anti-Japanese war culture once lightening and influencing the world's direction and evolution.

This is a city of memories, the song "Hymn for Red Plum-blossom", extremely popular in China and expressing the Hongyan revolutionary spirit witnessing the days of storms and fights. This is a city of emigration, the long-standing culture of the Three Gorges leaving behind eternal poems. With broad minds as an important part of the emigration culture, the whole world can feel Chongqing's wisdom, courage and insight.

The charm of Chongqing lies in the city's tremendous changes bursting from its inner power. Chongqing is rising as the western financial center. The open inland upland reveals a strong fusion effect.

As one of China's four municipalities directly under the Central Government,five national central cities and the national historic and cultural cities,as well as the economic center of the upper Yangtze River and the prominent economic growth pole in western China,Chongqing is the only city in China that owns two "bonded areas"---Lianglu Cuntan Bonded Port and Xiyong Integrated Bonded Area. Chongqing today has started its comprehensive development, increasingly demonstrating its spectacular courage and passion.

The charm of Chongqing lies in Chongqing people who keep forging ahead continuously and with strong sense of mission and responsibility. Great mountains and rivers have made the offspring in Bayu region brave and heroic. They are passionate people with deep feelings for and confidence in the city. They are industriously devoting sweat and wisdom to making the beautiful Chongqing the most livable city…Their dream about the city is where Chongqing's mighty confidence comes from: to make Chongqing a big harmonious family through wider opening up, bigger expanding, and greater prospering.

The charm of Chongqing lies in the beauty of "Silence Rain in Ba Mountains". Chongqing enjoys a mild climate due to its situation in the sub-tropical monsoon climate region. Its average annual temperature is around 18℃ with its average lowest temperature between 6~8℃in winter and its highest temperature above 35℃ in June and July. It has mild winters, hot summers, long frost-free periods and ample rain with an annual rainfall between 1,000 and 1,450mm, with night rains as frequent visitors when spring turns into summer.

The charm of Chongqing lies in the grand manner of the "mountain city". Here are a myriad of tall buildings, overpasses, river-crossing bridges and tunnels. All the city buildings are built along the hillsides. As a unique type of residential houses, the essence of stilt-houses can still be traced now at Ciqikou Ancient Town.

The city is on the mountain, mountain in city. The city looks like a peninsula embraced by the Yangtze River and Jialing River, and at the same time stands erectly on mountains and wooded hills. Standing on Chaotianmen Wharf, you can see the confluence of Jialing and the Yangtze rivers. Binjiang Avenue is like a spectacular and beautiful silver lace around the "mountain city". Tall buildings are built on the hillsides, and inside the city are meandering roads. When night falls, the night view of Chongqing is just like heaven onto earth.The two rivers reflect the whole city's lights, the mountains

of lights and rivers of lights become an integral part of the scene, and thus the city turns into a world of lights. Among the mountains and rivers are the city and its residents.

As a historic city with 3,000-year Bayu culture,the city is so charming and graceful.

As the youngest municipality of China,the city is bringing endless modern myths.

As one of the world's largest inland city of mountains and rivers,the city is keeping creating miracles.

As the economic center in the upper reaches of the Yangtze River,a brand-new Chongqing is moving towards the world through constant development.

The youngest municipality of China, welcomes you to take a look at the culture of mountains and rivers, to taste the fine food,to see the beautiful scenery, to appreciate the pretty women, and to invest in this open inland upland.

Contact Information

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Changchun University of Science and Technology

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

Conference Venue

All sessions will be held at Grand Metropark Hotel Chongqing

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1598 Jinkai Road, North New Zone, Yubei District, 401160 Chongqing, P. R. China

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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

Chongqing's Local Area Code: 023

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