

Conference Program



The 5th International Conference on Manipulation,

Manufacturing and Measurement on the

Nanoscale

3M-NANO 2015

Changchun, China 5 – 9 October 2015 **Organized by:**

Jilin University, China

International Society for Nano Manipulation, Manufacturing and Measurement

IEEE Nanotechnology Council (technically sponsored)

University of Oldenburg, Germany

Changchun University of Science and Technology, China

Tampere University of Technology, Finland

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Greetings

On behalf of the organizing committee, it is our great pleasure and honor to welcome you in Changchun at 3M-NANO 2015 conference!

3M-NANO is an annual International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, held for the fifth time in Changchun. 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. 3M-NANO 2015 is proud to offer an excellent technical program containing 20 keynote talks on major conference topics delivered by distinguished researchers and around 140 presentations in parallel technical program.





Bill Milne 3M-NANO 2015, Honorary Chair

Hong-Bo Sun 3M-NANO 2015, 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, 3M-NANO 2015 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 3M-NANO 2015. Last but definitely not least, we thank all the conference participants for their support and contribution. We do hope that 3M-NANO 2015 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 Changchun!

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Conference Information

Venue and Accommodation

Venue

Songyuan Hotel is the only downtown garden-style modern hotel in Jilin Province. It covers an area of more than eighty thousand square meters, and ancient trees, winding streets and different styles of pavilions nestled among lush greenery make the hotel a land of peace in the busy life.



Address: Conference Center 1169 Xinfa Street, Kuancheng District, Changchun, Jilin Province, P. R. China

Contact: Pany or Monica

Phone: +86 18343113013 or +86 18686300641

Accommodation

The venue of 3M-NANO 2015 is the Conference Center in the Songyuan Hotel. The accommodation is arranged in No. 3 Building (5-Star) and the Main Building (4-Star).



If you arrive at Changchun by air:



Train and Taxi: take the train to Changchun Railway Station (15 min, RMB 11) and take a taxi to Songyuan Hotel (2.4 km, around RMB 6);

Taxi: take a taxi to Songyuan Hotel (RMB 100).

If you arrive at Changchun by train:

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

Changchun Railway Station

Taxi: take a taxi to Songyuan Hotel (2.4km, around RMB 6);

Bus: take bus No.221 at Changchun station and get off at Children's Hospital bus station. Songyuan hotel is very close to this stop. Total fare RMB 1.

Changchun West Railway Station

Taxi: take a taxi to Songyuan Hotel (14 km, around RMB 30);

Bus: take bus No.314 at Changchun West station and get off at Kangping Street bus station. Songyuan hotel is very close to this stop. Total fare RMB 1.

Floor Maps of Conference Rooms

Conference Center

Multifunctional Hall, 2F



Conference Center

Rooms 1–3, 4F

Rooms 4–6, 5F



Conference registration will be arranged on the following days:

- 5 October 2015, 13:00 18:00
- 6 October 2015, 08:00 17:30
- 7 October 2015, 08:00 17:30
- Songyuan Hotel, Conference Center, 2F

Songyuan Hotel, No.3 Building, 1F

- Songyuan Hotel, Conference Center, 2F
- 8 October 2015, 08:00 17:30
- Songyuan Hotel, Conference Center, 2F

3M-NANO 2015 Program at a Glance

Monday, 5 Oct. 2015, No. 3 Building, 1F: 13:00-18:00			
R	Registration		
Tuesday, 6 Oct. 2015, C	Conference Center: 08:00–17:40		
08:00-08:40	Opening ceremony		
08:40—10:00	Keynote reports		
10:00—10:20	Break		
10:20—12:20	Keynote reports		
12:20—14:00	Lunch		
14:00—16:00	Parallel technical sessions		
16:00—16:20	Break		
16:20—17:40	Keynote reports		
17:40—20:00	Conference dinner		
Wednesday, 7 Oct. 2015, Conference Center: 08:00–18:00			
08:00—10:00	Parallel technical sessions		
10:00—10:20	Break		
10:20—13:00	Keynote reports		
13:00—14:00	Lunch		

14:00—15:40	Parallel technical sessions	
15:40—16:00	Break	
16:00—18:00	Keynote reports	
18:00—20:00	Conference dinner	
Thursday, 8 Oct. 2015, Conference Center: 08:00–18:00		
08:00—10:00	Parallel technical sessions	
10:00—10:20	Break	
10:20—11:40	Keynote reports	
11:40—14:00	Lunch	
14:00—16:00	Keynote reports	
16:00—16:20	Break	
16:20—17:00	Keynote report	
17:00—18:00	Closing ceremony	
18:00-20:00	Farewell banquet	
Friday, 9 Oct. 2015: 08:30–17:00		
Social culture activities		

Schedule of Keynote Reports

Tuesday, 6 October 2015, Multifunctional Hall, 2F

Conference Center

Time	Торіс	Speaker	
	Session Chair: Hong-Bo Sun		
08:40 - 09:20	Super-Resolution Lenses for Rapid and Large Area 3D Nanoscale Imaging	Wen-Jung Li	
09:20 - 10:00	Throughput Issues for Scanning Probe Imaging and Lithography	Stefanie Gutschmidt	
	Session Chair: Wen-Jung Li		
10:20 - 11:00	Mechatronic Equivalent of a Therapeutic Bacterial Nanorobotic Agent	Sylvain Martel	
11:00 - 11:40	Oscillation-based Methods for Fixation and Manipulation of Nano-particles	Valentin L. Popov	
11:40 - 12:20	Nano-Spike Electroporation System for Manipulation of Biological Cells at Ultra-low Voltages	Yi-Kuen Lee	
Session Chair: Valentin L. Popov			
16:20 – 17:00	Three-dimensional Printing of Integrated Microsystems in Single Monolith by Locally Tailoring Material Functionalities	Yves Bellouard	
17:00 - 17:40	Biomimetic Adhesive Microstructures as an Approach to Understand Functioning of Biological Systems	Stanislav Gorb	

Wednesday, 7 October 2015, Multifunctional Hall, 2F

Time Topic Speaker Session Chair: Gilles Dambrine Biomimetics of Gecko Locomotion: from Nano to Zhendong Dai 10:20 - 11:00Engineering Functional Inks of Layered Materials in Printed Electronics **Tawfique Hasan** 11:00 - 11:40and Photonics Micro and Nano Robotics on a Chip for Biomedical Fumihito Arai 11:40 - 12:20 Innovation Optical Imaging at the Nanometer Scale: Seeing What Light Prabhat Verma 12:20 - 13:00Cannot See Session Chair: Sylvain Martel Hand-Operating Nanotechnology: Manual Control of Katsuhiko Ariga 16:00 - 16:40 Molecular Machine Flexible and Stretchable Conductors for Electronics and Pooi See Lee 16:40 - 17:20**Energy Applications** High Frequency Characterization of Nanoelectronics: **Gilles** Dambrine 17:20 - 18:00**Challenges and Instrumental Solutions**

Conference Center

Thursday, 8 October 2015, Multifunctional Hall, 2F

Conference Center

Time	Торіс	Speaker
Session Chair: Masahiro Nakajima		
10:20 - 11:00	Long Range Visualisation of 300nm Diameter Particles as a Diagnostic for High Speed Combustion Flows	Peter J Bryanston-Cross
11:00 - 11:40	Helical Swimming Microrobots: Manufacturing, Characterization and Applications	Li Zhang
Session Chair: Peter J Bryanston-Cross		
14:00 - 14:40	Hybrid Nanomembranes: From Imperceptible Magnetoelectronics to Micro-biorobots	Oliver G. Schmidt
14:40 - 15:20	Photo Harvesting of Living Cell Sheets from NIR Active Conjugated Polymer Surfaces	Eunkyoung Kim
15:20 - 16:00	Micro-Nanomanipulation System under Environmental Scanning Electron Microscope for C. elegans	Masahiro Nakajima
Session Chair: Oliver G. Schmidt		
16:20 - 17:00	Nanoelectrochemical Systems (NECS): the Next Important Thing for NanoRobotics	Lixin Dong

Keynote Speakers

(in alphabetical order)

Micro and Nano Robotics on a Chip for Biomedical Innovation

Fumihito Arai

Professor Dept. of Micro-Nano Systems Engineering Dept. of Mechanical Science & Engineering Director Center for Micro-nano Mechatronics Nagoya University, Japan E-mail: arai@mech.nagoya-u.ac.jp



Abstract: Micro and Nano Robot is one of the promising tools for measurement and manipulation of biological cell with high throughput and high repeatability. Integration of the microfluidic chip and robotics based on MEMS and nanotechnology is key challenge for biomedical innovations. In addition to the advantage of environmental control by microfluidic chip, robot enables physical operation with high throughput. This talk discusses recent and essential developments in advanced micro-nano robotics.

Hand-Operating Nanotechnology: Manual Control of Molecular Machine

Katsuhiko Ariga

Professor World Premier International (WPI) Research Center for Materials Nanoarchitectonics (MANA) National Institute for Materials Science (NIMS), Japan E-mail: <u>ARIGA.Katsuhiko@nims.go.jp</u>



Abstract: We propose a novel methodology "hand-operating nanotechnology" where molecular orientation, organization and even functions can be handled and tuned by our macroscopic (hand) operation. This concept can be realized at dynamic two-dimensional medium such as thin films at the air-water interface. For example, we successfully manipulated molecular machines and realized capture and release of aqueous guest molecules at the air-water interface upon bulk (10-100 cm size) motion.

Three-dimensional Printing of Integrated Microsystems in Single Monolith by Locally Tailoring Material Functionalities

Yves Bellouard

Associate Professor School of Engineering, Institute of Microengineering Ecole Polytechnique F éd érale de Lausanne (EPFL) E-mail: <u>yves@bellouard.eu</u>



Abstract: Ultrafast lasers opens the opportunity to tailor material properties in the three-dimensions and with nanoscale resolutions thanks to non-linear absorption processes. In this talk, we will show how these unconventional laser-matter interaction combined with an additional chemical processing can be used for embedding a variety of functions in a monolith, turning a single piece of material into a system. This novel approach of manufacturing, based on the concept of system-material, not only allows unprecedented level of functional integration but also requires minimal infrastructures and energy. As illustrations, we will present various types of systems made using this manufacturing principle, from sensors to actuators, combining optical, fluids-handling and/or mechanical functions.

Long Range Visualisation of 300 nm Diameter Particles as a Diagnostic for High Speed Combustion Flows

Peter J Bryanston-Cross

Professor Warwick University, UK Visiting Professor Changchun University of Science and Technology, China Optical consultant for Massachusetts Institute of Technology, USA CEO PBX Laboratories, UK E-mail: pbryanston@aol.com



Abstract: The paper describes an automated Particle Image Velocimetry (PIV) system designed for synchronised combined 2 and 3 component velocity measurements. The system has been used to make measurements of velocity and turbulent kinetic energy in the exhaust region of an 1/8 scale gas turbine engine operating at high sub-sonic velocities and 1400 °C. For the PIV camera light detection the flow was seeded with 0.3 µm aluminium oxide particles. Tests were performed, to determine optimum camera positions based upon Mie scatter calculations for the particles.

Biomimetics of Gecko Locomotion: from Nano to Engineering Zhendong Dai Professor

Institute of Bio-inspired structure and surface engineering Nanjing University of Aeronautics and Astronautics Nanjing, China E-mail: zddai@nuaa.edu.cn

Abstract: Gecko's excellent locomotion ability largely results from the hundred thousands nano-scale seta, inspired by the nanostructure and the way to govern to seta array, we measured the 3D reaction forces of single toe and feet during freely motion, including attaching and detaching procedure, and developed quadruped robot moving on vertical substrate and weightless situation. Studies show that gecko's excellent locomotion ability results from the synergies among nano-structure, fine sensing and control to the reaction forces, which greatly inspire the design of gecko-mimicking robot.

High Frequency Characterization of Nanoelectronics: Challenges and Instrumental Solutions

Gilles Dambrine

Professor IEMN University of Lille, France E-mail: <u>gilles.dambrine@iemn.univ-lille1.fr</u>

Abstract: Test and metrology of nanoelectronics face to the large diversity of materials and devices as well as the complexity of future technologies. Measurements in high frequency arouse numerous activities at laboratory and industrial levels in the frame of on-wafer and probing characterizations at low scale. The communication will aim to overview the advanced researches in the domain of high frequency probing techniques and measurement bottlenecks.





Nanoelectrochemical Systems (NECS): the Next Important Thing for NanoRobotics

Lixin Dong

Professor Department of Electrical and Computer Engineering Michigan State University USA E-mail: <u>ldong@egr.msu.edu</u>



Abstract: The emerging nanoelectrochemical systems (NECS) as a field has been stimulated by the fast advancement of memristors, ion-batteries, etc. In-situ investigation of NECS provides the possibility to correlate the electron/ion transport properties of nanomemristors/batteries to the spatial carrier/ion distribution and motion. This talk reviews our recent efforts in the development of a series in-situ techniques for the investigation of NECS based on nanorobotic manipulation combined with transmission electron microscopy (TEM), scanning TEM (STEM), elementary analytical spectroscopy (e.g., energy-dispersive X-ray spectroscopy (EDS) and electron energy loss spectroscopy (EELS)), and a chemical work station. Whereas the significance of more efficient and compact batteries for micro-/nanorobotic systems is obvious, it is noted that memristic behavior can be influenced by mechanical stresses and ambient oxygen, showing that the nanowire memristor can serve as a passive sensor with memory (memristic sensor or "memsensor"), which can play a unique role in micro-/nanorobotic systems where power supply is difficult or impossible at all.

Biomimetic Adhesive Microstructures as an Approach to Understand Functioning of Biological Systems

Stanislav Gorb

Professor Department Functional Morphology and Biomechanics Zoological Institute of the University of Kiel, Germany E-mail: <u>sgorb@zoologie.uni-kiel.de</u>



Abstract: Biological hairy attachment systems have robust adhesion and high reliability of contact. Previous comparative experimental studies on biological systems showed the way to development of novel glue-free adhesives. While producing the reversible adhesives, mimicking the gecko attachment system, still remains the main direction of research in the field, very convincing results have been achieved in manufacturing adhesive microstructures inspired by male chrysomelid beetles. Comparative studies on microstructures with different contact geometries showed that beetle-inspired mushroom-shaped adhesive microstructure (MSAMS) even outperform the gecko-inspired spatula-shaped geometry under certain conditions. Adhesion of MSAMS is reversible and even stronger under water. MSAMS demonstrated stick-slip free friction and lower impact of contamination by particles. MSAMS can keep its adhesive capability over thousands of attachment cycles. On rough substrates, their performance can be enhanced by the introduction of fluid into the contact zone. Additionally, the development of MSAMS provides an opportunity for biologists to run experiments, which would be otherwise only hardly possible with real biological system. The present lecture discusses how the knowledge obtained from studies on MSAMS can be applied to understanding function of biological adhesive systems of insects.

Senior Lecturer

Stefanie Gutschmidt

Mechanical Engineering University of Canterbury, New Zealand

Throughput Issues for Scanning Probe Imaging and Lithography

E-mail: stefanie.gutschmidt@canterbury.ac.nz



Abstract: Micro-electromechanical cantilever arrays offer a tangible solution to high-speed and precision imaging and manipulation technologies such as scanning probe microscopy and lithography. However, associated multi-physics coupling and observed nonlinear dynamic behaviour are currently not fully understood and thus prevent successful implementation of an otherwise promising solution. In this work we present the underlying physics of nonlinear dynamics and coupling phenomena of a self-sensing, self-transducing cantilever array in non-contact operation mode. Our theoretical approach is based on nonlinear classical continuum mechanics in combination with numerical simulations, and complemented by experimental investigations.

Functional Inks of Lavered Materials in Printed Electronics and Photonics

Tawfique Hasan

Dr

University Lecturer in Electronic Materials and Devices Royal Academy of Engineering Research Fellow Cambridge Graphene Centre, Engineering Department Cambridge University, United Kingdom E-mail: th270@cam.ac.uk



Abstract: I will talk about formulation of layered material ink systems with a short and a long term vision. On a shorter term, I will talk about their commercial prospect as conductive, high viscosity inks and composites. On a longer term, I will discuss semiconducting layered material based ink systems and their heterostructures for next generation photonic applications.

Photo Harvesting of Living Cell Sheets from NIR Active Conjugated Polymer Surfaces

Eunkyoung Kim

Professor Department of Chemical and Bimolecular Engineering Yonsei University Korea E-mail: <u>eunkim@yonsei.ac.kr</u>



Abstract: Various types of live cells, e.g. human mesenchymal stem cells (MSCs) and human dermal fibroblasts, were efficiently and selectively harvested by near-infaraed (NIR) light using the photothermal effect of a conductive polymer nano-thin film. The absorption of PEDOT thin films in the NIR region was effectively triggered cell harvesting upon exposure to an NIR source. This light-induced cell detachment method provides the temporal and spatial control of cell sheet harvesting, as well as cell patterning useful for depletion of a specific subset from heterogeneous population during culture.

Flexible and Stretchable Conductors for Electronics and Energy Applications

Pooi See Lee

Associate Professor School of Materials Science and Engineering Nanyang Technological University Singapore E-mail: <u>PSLee@ntu.edu.sg</u>



Abstract: This talk discusses our recent progress on developing flexible and stretchable conductors for emerging wearable electronics, stretchable displays, pressure sensors, deformable and conformable visual electronics. The key challenge of achieving flexible and stretchable conductors using micro- and nanostructuring approaches will be elucidated. We further extend the platform technology into energy devices such as stretchable battery or supercapacitor electrodes.

Nano-Spike Electroporation System for Manipulation of Biological Cells at Ultra-low Voltages

Yi-Kuen Lee

Professor Department of Mechanical & Aerospace Engineering Division of Biomedical Engineering Institute of Integrated Microsystem Hong Kong University of Science & Technology, Hong Kong E-mail: <u>meyklee@ust.hk</u>

Abstract: We developed a novel nano-spike electroporation (Nano-EP) device for manipulation of biological cells at ultra-low applied voltage using nano-imprint and electrochemical anodization. The Nano-EP system integrated with a portable electroporator and a smartphone-based control app has demonstrated for manipulations of biological cells for biotechnology, including electroporation, electric cell lysing and extraction of DNA/protein at much higher efficiency and cell viability in comparison with existing micro/nano devices.

Super-Resolution Lenses for Rapid and Large Area 3D Nanoscale Imaging

Wen-Jung Li

Professor Dept. of Mechanical and Biomedical Engineering City University of Hong Kong Hong Kong SAR, China E-mail:<u>wenjungli@gmail.com</u>

Abstract: Recent studies have shown that dielectrics with specific morphology have the capability to provide image resolution beyond optical diffraction limit. In this lecture, we will show that specific microspheres and microlenses could be used to break the diffraction limit and provide 3D images of nanoscale structures with lateral dimensions below 100nm and vertical dimension below 20nm. The optically-based super-resolution method developed by our team is a ground-breaking technique for imaging nanoscale structures because: (1) it provides the imaging of 3D nano-structures with at least an order of magnitude faster time than AFMs; (2) it provides a much larger field-of-view than scanning probes; (3) compared to the existing and prevalent optically-based nano-imaging methods, it does not need fluorescent particles for nanoscale imaging. The super-resolution capability of the microspheres/microlenses mainly originated from near-field optical principles. We will show in this lecture that the lateral resolution of our system is enhanced by microspheres/microlenses achieving near-field sub-diffraction limit details from the transformation of evanescent waves to propagating waves. The fundamental concepts and theoretical basis for this new super-resolution 3D imaging system will be elucidated in this lecture.





Mechatronic Equivalent of a Therapeutic Bacterial Nanorobotic Agent

Sylvain Martel

Professor Director, NanoRobotics Laboratory Department of Computer and Software Engineering Institute of Biomedical Engineering École Polytechnique de Montr éal, Canada Email: sylvain.martel@polymtl.ca

Abstract: Drug-loaded MC-1 magnetotactic bacteria have been investigated as non-systemic delivery nanorobotic agents to target and deliver therapeutic payloads in hard-to-reach hypoxic regions of solid tumors in order to maximize the therapeutic efficacy. To demonstrate that the development of an artificial nanorobotic agent offering similar characteristics would be beyond present technology feasibility, an equivalent mechatronic model is presented providing a more accurate description of the level of complexity involved.

Micro-Nanomanipulation System under Environmental Scanning Electron Microscope for C. elegans

Masahiro Nakajima

Assistant Professor Center For Micro-nano Mechatronics Nagoya University Japan E-mail: <u>nakajima@mein.nagoya-u.ac.jp</u>

Abstract: Micro-nanomanipulation is widely used for various biological and medical applications. This talk presents our micro-nanomanipulation system under an environmental scanning electron microscope (E-SEM) for Caenorhabditis elegans (C. elegans). The C. elegans is one of the smallest animal used as a model organism. The micro-nanomanipulation system realizes semi-wet manipulation which is able to keep samples from drying out by vacuum pressure for electron microscopic observation.





Oscillation-based Methods for Fixation and Manipulation of Nano-particles

Valentin L. Popov

Professor Berlin University of Technology Germany E-mail: <u>v.popov@tu-berlin.de</u>



Abstract: Many methods of fixation, locomotion, actuation and manipulation of objects at the nano-scale are based on the interaction of the objects with oscillating fields. In this keynote talk, an overview of various actuation mechanisms used by nature and man will be discussed. Special attention will be given to the influence of friction, viscoelasticity and adhesion on the controllability of the actuation.

Hybrid Nanomembranes: From Imperceptible Magnetoelectronics to Micro-biorobots

Oliver G. Schmidt

Director Institute for Integrative Nanosciences IFW Dresden, Germany Professor University of Technology Chemnitz, Germany E-mail: o.schmidt@ifw-dresden.de



Abstract: Nanomembranes are thin, flexible, transferable and can be shaped into 3D micro- and nanoarchitectures. This makes them attractive for a broad range of applications and scientific research fields ranging from flexible imperceptible magnetoelectronic devices to ultra-compact autonomous micro- and micro-biorobotic systems. If nanomembranes are differentially strained they deform themselves and roll-up into tubular structures upon release from their mother substrate. Rolled-up nanomembranes can be exploited to rigorously compact electronic circuitry, energy storage units and novel optical systems. If appropriate materials are chosen, rolled-up tubes act as tiny microrobotic motors which in the ultimate limit may drive compact multifunctional autonomous systems for medical and environmental applications.

What Light Cannot See Prabhat Verma

Optical Imaging at the Nanometer Scale: Seeing

Director Japan Society of Applied Physics Professor Dept. of Applied Physics Osaka University, Japan E-mail: <u>verma@ap.eng.osaka-u.ac.jp</u>



Abstract: Since nanomaterials are much smaller than the wavelength of visible light, it is not possible to image them even with the best possible optical microscope. Here, I will discuss how we can manipulate and confine light within a few nanometers using optical antenna and exploit it to "see" nanomaterials using visible light.

Helical Swimming Microrobots: Manufacturing, Characterization and Applications

Li Zhang

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Abstract: Recent developments in helical swimming microrobots, mimicking the propulsion of E. coli bacteria, will be presented in this talk. To date, different top-down and bottom-up micromanufacturing methods were introduced to fabricate these tiny devices with a high-yield and/or a controllable shape, size and chirality. Experimental results indicate that three-dimensional (3-D) locomotion, force and torque generated by helical swimming microrobots can be precisely controlled using a low-strength, rotating magnetic field. Furthermore, based on their designed morphologies, materials, and functionalization, these miniaturized magnetic helical micromachines are expected to be applied as remotely-actuated probes for manipulation of biological objects at single-cell level and for targeted payload delivery in vitro and in vivo.

Technical Program

(ss: Technical Special Session)

Tuesday, 6 October 2015, 14:00–16:00 Conference Center, 4F & 5F

No.	Room	Session
01	Room 1	ECROBOT
02	Room 2	Nanomechanics and Nanomechatronics
03	Room 3	Nanohandling Robots and Systems
04	Room 4	Femtosecond Laser Micro-nanofabrication Technology and Application (ss)
05	Room 5	BIORA
06	Room 6	NEMS and Their Applications

Wednesday, 7 October 2015, 8:00–10:00

Conference Center, 4F & 5F

No.	Room	Session
07	Room 1	Electrochemical Micro- and Nano- Fabrication (ss)
08	Room 2	Bio-nano Devices and Applications
09	Room 3	FebSurfWAR
10	Room 4	Self-assembled Nanostructures and Nanomaterials and the Application (ss)
11	Room 5	Advances on Micro and Nano Energy Harvesting (ss)
12	Room 6	University of Shanghai Cooperation Organization Nanotechnology

Wednesday, 7 October 2015, 14:00–15:40 Conference Center, 4F & 5F

No.	Room	Session
13	Room 1	Self-assembled Nanostructures and Nanomaterials and the Application (ss)
14	Room 2	Surface Plasmon Photonics (ss)
15	Room 3	Micro-and Nano-Photonics and Bioapplications (ss)
16	Room 4	Nanoelectronics and Nanomagnetics
17	Room 5	Design and Control of Micro/nano Mechanisms (ss)
18	Room 6	3D Printing and AFM-Related Topics (ss)

Thursday, 8 October 2015, 8:00–10:00 Conference Center, 4F & 5F

No.	Room	Session
19	Room 1	Nanometrology and Nanocharacterization
20	Room 2	Nanopore Technology (ss)
21	Room 3	Nanofabrication and Nanoassembly
22	Room 4	Micro-/Nanomanufacturing Technology for Emerging Devices and Tools (ss)
23	Room 5	Surface Fabrication with Sub-nanometer Precision (ss)
24	Room 6	Nanomaterials and Emitting Devices (ss)

Technical Session 01 ECROBOT

Room 1 14:00–16:00 Tuesday, 6 October Chair: Carsten Maple, Co-Chair: Yong Yue

01-1 14:00-14:20



01-2 14:20–14:40



01-3 14:40-15:00





Technical Session 01 ECROBOT Room 1

14:00–16:00 Tuesday, 6 October Chair: Carsten Maple, Co-Chair: Yong Yue

01-4 15:00-15:20



01-5 15:20–15:40

HS-WEDM Machining of Superamphiphobic AI Surfaces and Effect of the Droplet Size on Wettability Zhongxu Lian, Yanling Wan, Jinkai Xu and Huadong Yu

College of Mechanical and Electric Engineering, Changchun University of Science and Technology, China Zhankun Weng

International research centre for nano handling and manufacturing of China, Changchun University of Science and Technology, China

 Al surfaces were produced with water/oil high contact angle and low sliding angle;
The superamphiphobic property of the Al surfaces is still exhibited after the durability tests:

 Superamphiphobic Al surfaces could see many wide potential applications including self-cleaning, anti-fouling, etc.





01-6 15:40-16:00





Technical Session 02 Nanomechanics and Nanomechatronics Room 2 14:00–16:00 Tuesday, 6 October Chair: Valentin L. Popov, Co-Chair: Hairong Wang

02-1 14:00-14:20

The Influence of Grinding Process Parameters on Transmittance and Absorbance of the Optical Components

Hairong Wang *, Hongfeng Chen, Guanglong Fu, Huapan Xiao State Key Laboratory for Manufacturing Systems Engineering Mechanical Engineering, Xi'an Jiaotong University, China

- This paper proposes a study about the influence of grinding process parameters(abrasive size, grinding force, wheel speed, grinding depth) on the optical properties of the optical components, such as transmittance and absorbance;
- This work provides a foundation for revealing how the subsurface damage influences on the optical properties and is also useful to probe into the mechanism of damage induced by laser for the high-precision optical components.



02-2 14:20–14:40





Technical Session 02 Nanomechanics and Nanomechatronics Room 2 14:00–16:00 Tuesday, 6 October Chair: Valentin L. Popov, Co-Chair: Hairong Wang

02-4 15:00-15:20



02-5 15:20–15:40


Technical Session 03 Nanohandling Robots and Systems Room 3 14:00–16:00 Tuesday, 6 October Chair: Victor Koledov, Co-Chair: Joshua Pinskier

03-1 14:00-14:20



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03-2 14:20–14:40



03-3 14:40-15:00





Technical Session 03 Nanohandling Robots and Systems Room 3 14:00–16:00 Tuesday, 6 October Chair: Victor Koledov, Co-Chair: Joshua Pinskier

03-4 15:00-15:20

Structure and Morphology of the Zn_xMg_{1-x}O Nanowires Studied using Shape Memory **Composite Nano-tweezers** Notes_{*} Victor Koledov, Vladimir Shavrov and Alexey Zhikharev Kotelnikov Institute of Radioengineering and Electronics, RAS Moscow, Russia Nanowires (NWs), nano rods, nano whiskers are an important class of materials with the great potential for applied and fundamental basic research. The cross section of NWs is different forms and is uniform with a high aspect ratio. The present paper reports application of the new nano-tweezers system for experimental investigation of the individual nanowires of ${\rm Zn}_x{\rm Mg}_{1,x}O,$ which is the example of submicron-sized objects whose individual properties are difficult to study by standard methods.

03-5 15:20–15:40

Nano-nanomanipulation of CdSe Nanowires using Nano-tweezers Based on Shape Memory Alloys

Victor Koledov, Vladimir Shavrov Kotelnikov Institute of Radioengineering and Electronics,Moscow, Russia, M. Fawzy, M. Blumenthal

Department of Physics, The University of Cape Town, Rondebosch, SA

New technology in 3D-nanomanipulation has been proposed based on the properties of NiTi based functional alloys that exhibit thermoelastic martensitic transition and shape memory effects (SME) at micro and submicrometer dimensions. Report gives a survey of new system can be applied to numerous problems, which require the manipulation and processing of nano and micro objects, especially the application of the new technology of 3D-manipulation to the experimental study of individual CdSe nanowires. Notes.

Technical Special Session 04 Femtosecond Laser Micro-nanofabrication Technology and Application Room 4 14:00–16:00 Tuesday, 6 October Organizer: Qidai Chen Co-Chair: Feng Chen

04-1 14:00-14:20

Bioinspired Microfabrication of Functional Structures and Devices

Feng Chen*, Qing Yang and Xun Hou State Key Laboratory for Manufacturing System Engineering & Key Laboratory of Photonics Technology for Information of Shaanxi Province, School of Electronics & Information Engineering, Xi'an Jiaotong University, Xi'an, 710049, P. R. China

 In this talk, we will summarize the recent progress in the development of bioinspired functional structures and devices via femtosecond laser microfabrication, with a focus on compound eyes, microlens arrays, 3D microchannels and smart wetting surfaces, as well as their applications in optics, biology, microfluidic devices, all of which demonstrate the ability of laser microfabrication in producing various multiscale structures and its adaptation in a great variety of materials.



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04-2 14:20–14:40

High Performance Micro-Optics Fabricated by Femtosecond Lasers

Qi-Dai Chen

State Key Laboratory on Integrated Optoelectronics, Jilin University, China

- The ultimate resolution of femtosecond laser micronanofabrication is explored; A high precision machining resolution less than 20 nm is achieved;
- High-fidelity micro-optics, such as fresnel zone plate, dammann grating and microlens fabricated by femtosecond laser nanofabrication was realized;
- An important application of micro-optical elements for the semiconductor laser diode beam shaping was demonstrated. Bifocal zone-plate lenses were fabricated and the divergence angles of VCSEL were reduced from 65° (fast axis) and 24° (slow axis) to 7.7mrad and 136.5 mrad, respectively.



04-3 14:40-15:00







04-4 15:00-15:20

Fiber Sensor Fabricated by Femtosecond Laser

Xiaoyan Sun and Ji'an Duan State Key Laboratory of High Performance Complex Manufacturing, College of Mechanical and Electrical Engineering, Central South University, China

• An improved transversal-scanning inscription method is proposed to fabricate LPFGs. Curvature sensitivities are -4.82nm/m⁻¹ and -1.63nm/m⁻¹ at the 0°and 90°bend orientations respectively, which is higher than that fabricated by femtosecond direct writing;



All-optical fiber sensor based on an ultra-compact inline MZI fabricated by femtosecond laser and chemical etching is demonstrated;

The introduction of V-slot in fiber don't destroy the structure bending strength. And it's RI and temperature sensitivity are -12031.75nm/RIU and transmission spectra variation concentration

2.1977nm/°C, respectively.

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04-5 15:20–15:40

Hybrid Femtosecond Laser Microfabrication for 3D Integrated Lab-on-a-chip Systems Jiawen Li and Dong Wu University of Science and Technology of China, Department of Precision Machinery and Precision Instrumentation · Methods: Femtosecond laser-assisted wet etching (FLAE) + Fs laser two-photon polymerization (TPP): · Laser: The second harmonic (522 nm) from commercial fs laser (FCPA Jewel D-400, IMRA America; wavelength: 1045 nm; pulse width: 360 fs: repetition rate: 200 kHz): · Devices: Integrated filter-mixer; Fig.1. Design, fabrication, · Functions: Excellent performance in simultaneous performance and application of 3D ship-in-a-bottle biochip. filtering and mixing.

04-6 15:40-16:00



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Technical Session 05 BIORA Room 5

14:00–16:00 Tuesday, 6 October Chair: Dayou Li, Co-Chair: Jing Li

05-1 14:00-14:20



05-2 14:20–14:40

Design and Characteristics of a Compliant Microgripper Dedicated to Fast Microhandling

Fujun Wang*, Cunman Liang, Yanling Tian, Xingyu Zhao, Dawei Zhang School of Mechanical Engineering, Tianjin University, China

 A novel piezoelectric actuated microgripper with a two-stage flexure-based amplification was proposed;

The kinematic, static and dynamic models of the microgripper were established;

Experiments show that the microgripper has good performance and fast grasping of copper wires can be realized through the microgripper.



Microgripper mechanism



05-3 14:40-15:00

Adhesive Behavior Study Between Cellulose and Borosilicate Glass using Colloidal Probe Technique Yuli Lai and Pasi Kallio Department of Automation Science and Engineering, Tampere University of Technology, Tampere, Finland Yasuhito Sugano and Johan Bobacka Johan Gadolin Process Chemistry Centre, Laboratory of Analytical Chemistry, Åbo Akademi University, Turku, Finland	Notes.
 Study of Adhesive behavior between cellulose and borosilicate glass; Adhesion Force and Adhesion Energy were measured using AFM with colloidal probe; Interfacial Energy between cellulose and borosilicate glass was calculated through JKR mode; Test results were compared with previous adhesive behavior study between gypsum and cellulose. 	

Technical Session 05 BIORA Room 5 14:00–16:00 Tuesday, 6 October Chair: Dayou Li, Co-Chair: Jing Li

05-4 15:00-15:20



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05-5 15:20–15:40

Dynamic Detection and Depth Location of Pipette Tip in Microinjection

Fujun Sun, Peng Pan, Jun He, Feiyu Yang,

Changhai Ru* Research Center of Robotics and Micro System & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, China

- A method of detecting and recognizing pipette tips was proposed;
- The tip coordinates of pipette was determined by the most right point of pipette contour;
- Tip depth location was realizing by comparing the deformation in X direction:

· The method of tip recognition and location could



Tip recognition under different magnification

05-6 15:40-16:00

reach high success rate.



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Technical Session 06 NEMS and Their Applications Room 6 14:00–16:00 Tuesday, 6 October Chair: Hui Tang, Co-Chair: Zhuang Xiong

06-1 14:00–14:20



06-2 14:20-14:40

A Silicon Based Low-g MEMS Inertial Switch For Linear Acceleration Sensing Application

Zhuang Xiong, Fengtian, Zhang, Yingdong Pu, Bin Tang, Jie Yang, Chao Wang

Institute of Electronic Engineering, China Academy of Engineering Physics, Mianyang, 621999, China

- A silicon based low-g inertial switch typically used for linear acceleration sensing is designed and fabricated;
- The inertial switch consists of a high volume proof mass and low stiffness spiral spring;
- The switch is fabricated on a special designed double-buried layer SOI wafer with standard silicon micromachining;
- The threshold value measured is about 7.42 g which is in accordance with FEM calculation.

06-3 14:40–15:00



SEM picture of the MEMS inertial switch



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Technical Session 06 NEMS and Their Applications Room 6 14:00–16:00 Tuesday, 6 October Chair: Hui Tang, Co-Chair: Zhuang Xiong

06-4 15:00–15:20



06-5 15:20–15:40

Catalyst-Free, Selective Growth of ZnO Nanowires on SiO2 by Chemical Vapor Deposition for Transfer-Free Fabrication of UV Photodetectors Liping Xu and Zhankun Weng

JR3CN &CNM, Changchun University of Science and Technology, China Liping Xu, Zhaoyao Zhan and Wenqiang Lu Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China Rough SiO2/Si substrate surface created by

reactive ion etching; • Catalyst-free, selective growth of ZnO nano-

wires directly on SiO2 layer;

Transfer-free process to fabricate ZnO nanowire UV photodetector.

06-6 15:40–16:00





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07-1 8:00-8:20



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07-2 8:20-8:40

Simulation on Etching Process with the Coupling Effect of the Motion Flow Field and CELT

Yongda Yan, Yongzhi Cao, Shusen Guo, Zhenjiang Hu, Xuesen Zhao and Zengqiang Li Center for Precision Engineering, Harbin Institute of Technolog, China

- A hydrodynamic model of the chemical etchant layer
- in the motion mode is established;
- Effects of parameters of the electrodes and etchant solution on the etching process are studied;
- Preliminary simulations using this method to process

 Preliminary simulations using this method to proce ultra-smooth surface are carried out;

 An electrochemical micro-nanofabrication system with the functions of precision motion and CELT is established.



Etched structures with CELT based on rotation (a) and translation (b) motions

07-3 8:40-9:00





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Technical Special Session 07 Electrochemical Micro- and Nano- Fabrication Room 1 8:00-10:00 Wednesday, 7 October Organizer: Dongping Zhan Co-Chair: Yongda Yan

Replicated microlens array

Schematic illustration of the

process of ECBM

07-4 9:00-9:20

Electrochemical Simulation Model of Micromachining Process in CELT Hang Zhou and Limin Zhu School of Mechanical Engineering, Shanghai Jiao Tong University, China · Fundamental simulation model built for the fabricating process of CELT using COMSOL Multiphysics; Self-developing micromachining system and precise mold-substrate contact detection method;

• By using the optimal electrolyte, a microlens array was successfully fabricated with high accuracy.

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07-5 9:20-9:40

Electrochemical Buckling Microfabrication(ECBM)

Jie Zhang and Dongping Zhan Department of Chemistry, College of Chemistry and Chemical Engineering, Xiamen University, China

- · We developed a method for the fabrication of multilevel microstructures on semiconductors;
- The method called electrochemical buckling microfabrication (ECBM) combined the buckling effect on 3D curved surface and the confined





07-6 9:40-10:00





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Technical Session 08 Bio-nano Devices and Applications Room 2 8:00–10:00 Wednesday, 7 October Chair: Christoph Nick, Co-Chair: Haiyun Wu

08-1 8:00-8:20



08-2 8:20-8:40



08-3 8:40–9:00



Technical Session 08 Bio-nano Devices and Applications Room 2 8:00–10:00 Wednesday, 7 October Chair: Christoph Nick, Co-Chair: Haiyun Wu

08-4 9:00–9:20



08-5 9:20-9:40



08-6 9:40-10:00

Efficient Mesoporous Anatase-brookite TiO ₂ Photocatalysts for Degradation of Ibuprofen Said M. El-Sheikh, Tamer M. Khedr and Adel A. Ismail Nanostructured Materials Lab., Advanced Material Department, CMRDI, Cairo 11421, Egypt
Tamer M. Khedr and Waheed A. Badawy
Department of Chemistry, Faculty of Science, Cairo University, Gamaa Street, 12 613 Giza Equat
Synthesis of pure brookite and mesoporous anatase
brookite nano-heterojunction photocatalyst;
 The photocatalytic degradation of ibuprofen with low concentration was investigated using these novel TiO₂ materials;
The anatase/brookite TiO ₂ samples showed a superior photocatalytic activity compared to pure
brookite IIO ₂ ; XRD patterns of as-synthesized
High activity of A/B is due to the synergistic effect, TiO ₂ : I, II, III, and IV. high surface area and mesoporous structure.



Technical Session 09 FebSurfWAR Room 3 8:00–10:00 Wednesday, 7 October Chair: Xianping Liu, Co-Chair: Liangyu Cui

09-1 8:00-8:20



09-2 8:20-8:40

Investigation of Work of Adhesion of Biological Cell (Human Hepatocellular Carcinoma) by *AFM* Nanoindentation 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 • Human hepatocellular carcinoma cells treated with fullerenol for 24, 48 and
- 72 hours:
- Atomic force microscope was used to investigate biomechanical properties of cells;
- JKR model was used to fit the force-displacement curves, resulting a new parameter work of adhesion;
- Differences between the 4 type cells were observed in terms of elastic modulus and work of adhesion.

Contribution: this paper quantitatively characterizes cell adhesion and reveals its potential biomedical application

09-3 8:40-9:00





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Technical Session 09 FebSurfWAR

Room 3 8:00–10:00 Wednesday, 7 October Chair: Xianping Liu, Co-Chair: Liangyu Cui

09-4 9:00-9:20



09-5 9:20-9:40

Effect of Surface Area on the Wettability of Dual Micro- and Nanostructures Fabricated by Laser Interference Lithography

Litong Dong, Qi Liu and Yuxuan Liu JR3CN & CNM, Changchun University of Science and Technology, China Wenjun Li, Dayou Li and Zuobin Wang*

JR3CN & IRAC, University of Bedfordshire, UK In this work, we present experimental work that reveals the relation between the surface areas of dual micro- and nanosturctures and wettability of materials. It's an effective method to utilize laser interference lithography (LIL) to fabricate the bionic dual micro- and nanosturctures of lotus leaves. For further local work function measurements, many kinds of dual micro- and nanosturctures have been fabricated on iron-nickel alloy. It shows that the CA has a close relationship with the surface area of the dual micro- and nanosturctures.



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SEM images of the iron-nickel alloy sample and a photograph of a water droplet on the sample

09-6 9:40-10:00



Technical Special Session 10 Self-assembled Nanostructures and Nanomaterials and the Application Room 4 8:00–10:00 Wednesday, 7 October Organizer: Mingdong Dong Co-Chair: Lei Liu

10-1 8:00-8:20

A High-throughput Strategy to Bone Tissue Engineering

Alireza Dolatshahi-Pirouz DTU Nanotech, Danmarks Tekniske Universitet, Denmark

· Microprinting of cellular constructs;

- Three-dimensional cellular microarrays for stem cell differentiation screening;
- High-througput screening of bony 3D environments;
- Micro&Nanoengineering approaches for bone tissue engineering.



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10-2 8:20-8:40

Nanoscale Characterisation of Stem Cells by Atomic Force Microscopy

Ramesh Subramani, Tim Odenthal and Herman Raman Division of Mechatronics, Biostatistics and Sensors (MeBioS) Javed Karim Manesia and Catherine Verfaillie Stem Cell Biology and Embryology Hans Vann Oosterwyck

- Division of Biomechanics, KU Leuven, Belgium
 There is a lack of knowledge of how the biophysical cues
- play role in stem cells fate determination; Therefore, using AFM, We have investigated the physical properties of the mice HSCs from bone marrow and fetal liver;
- We have also detected small batches of uneven brush layer on the surface of the HSCs;
- This obtained physical properties might offer information about how the cell interacts with its surrounding or extra cellular matrix and lead us to develop and design better micro-environment to control the stem cells characteristics.

Figure 1: AFM forcedistance curve on HSCs: a,b) cell with even brush layer, c,d) cell with uneven brush layer.

10-3 8:40-9:00







10-4 9:00-9:20

	Collagen-based Tissue Studied by Quantitative Dynamic Atomic Force Microscopy				
	Dan Xia Interdisplinary Nanoscience Center, Aarhus Univer	sity, Denmark			
•	QD-AFM study of the self-assembled collagen-based tissue; QD-AFM study of the tissue related diseases;				

- The topography and corresponding mechanical properties of the tissues have been investigated at nanoscale;
- Provide fundamental mechanism-based understanding of native collagen-based tissue function, quality, and pathology.

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10-5 9:20-9:40



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11-1 8:00-8:20



11-2 8:20-8:40

Electrostatic Energy Harvesting Device With Broad Bandwidth Ai Zhang, Zhuoteng Peng, Shanshan Li and Fei wang

Department of Electrical and Electronic Engineering, South University of Science and Technology of China, China Ai Zhang, Shanshan Li and Fei wang

Shenzhen Key Laboratory of 3rd Generation Semiconductor Devices, China

- The frequency broadband solution of the device is realized by coupling effect of two cantilevers closed to each other in vibration process;
- Compared to the frequency response of each separate subsystem the davice with two response subsystems can
- subsystem, the device with two resonant systems can generate a decent power output over a broader bandwidth; • The energy harvesting device can realize broaden band gap.
- The energy harvesting device can realize broaden band gap, hence significantly improves the vibration-to-electricity energy conversion efficiency.



Experimental results of RSM powers vs frequencies of the vibration sources at different acceleration amplitudes.

11-3 8:40-9:00



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11-4 9:00-9:20



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11-5 9:20-9:40



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Technical Session 12 University of Shanghai Cooperation Organization Nanotechnology Room 6 8:00–10:00 Wednesday, 7 October Chair: Xing Lu, Co-Chair: Chengyuan Xu

12-1 8:00-8:20



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Tunable Photoluminescence Property in MoS₂/graphene Heterostructures via Electrochemical Gating

Yang Li, Cheng-Yan Xu, Jing-Kai Qin, and Liang Zhen State Key Laboratory of Advanced Welding and Joining, School of Materials Science and Engineering Harbin Institute of Technology, Harbin 150080. China

- Exciton intensity could be modulated in a large
- range (more than two-order of magnitude);
- The blueshift of exciton or trion peaks up to 40 meV is observed;
- Electric field modulated carrier densities in both MoS₂ and graphene;
- The variation of MoS₂ carrier density plays a dominant role in PL modulation;
- Band alignment at the interface has minor contribution to PL modulation.

12-3 8:40-9:00

Biomimetic Autonomous Micro/Nanomotor Zhiguang Wu, Qiang He* Key Lab for Microsystems and Microstructure Manufacturing The Academy of Fundamental and Interdisciplinary Science Harbin Institute of Technology Harbin, China

- devices or equipments capable of converting chemical energy or other energy into mechanical energy or movement to achieve self-propulsion;
- By mimicking the biomotors, we constructed biocompatible and biodegradable motors based on the biomimetic design and controllable assembly;
- The functionalization of cell membranes to the synthetic motor achieved the efficient propulsion in biofluids due to its antibiofouling effect.



Schematic illustration and PL

modulation in MoS₂/graphene

heterostructures

Biomimetic micro/nanomotors prepared by controllable assembly technique

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Technical Session 12 University of Shanghai Cooperation Organization Nanotechnology Room 6 8:00–10:00 Wednesday, 7 October Chair: Xing Lu, Co-Chair: Chengyuan Xu

12-4 9:00–9:20

Endohedral Metallofullerenes (EMFs): Novel Metal-Carbon Hybrid Molecules	Notas
Xing Lu School of Materials Science and Engineering, Huazhong University of Science and Technology, Wuhan, China	Notes
 New molecules and new structures; New chemistry and platform; New function and property; Potential application 	

12-5 9:20-9:40

Self-propelled Micro/Nanomotors Based on Controlled Assembled Architectures

Qiang He Lab for Microsystems and Microstructure Manufacturing Harbin Institute of Technology Harbin, China gianghe@hit.edu.cn

- · Synthetic nanomotors represent one of the most
- exciting yet challenging area in nanotechnology;
- We have constructed self-propelled biomimetic nanomotors with controllable assembly technique;
- The propulsion strategy includes bubble propulsion, near infrared-triggered thermalphoresis, and ultrasound propulsion, the direction can be magnetically navigated;



on molecular assembly

• The functionalization of the artificial motor with biological entities have been achieved.



12-6 9:40-10:00



Technical Special Session 13 Self-assembled Nanostructures and Nanomaterials and the Application Room 1 14:00–15:40 Wednesday, 7 October Organizer: Mingdong Dong Co-Chair: Lei Liu

13-1 14:00-14:20

Enhanced Photocatalytic Reactions on Metal-Biomaterial Hybrids with High Conductivity

Yun-xiang Pan

School of Chemistry and Chemical Engineering, Hefei University of Technology, China

- Metal-biomaterial hybrids with highly dispersed metal nanoparticles and high conductivity were successfully fabricated through a green and simple cold-plasma-assistant method;
- The metal-biomaterial hybrids exhibit highly enhanced activity to photocatalytic water splitting and CO₂ reduction, as compared with inorganic materials;
- The metal-biomaterial hybrids are good candidate catalysts for imitating natural photosynthesis.



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13-2 14:20–14:40

Fabrication and Application of Artificial Cell Membrane

Xiaojun Han

State Key Laboratory of Urban Water Resource and Environment, School of Chemical Engineering and Technology, Harbin Institute of Technology, China Email: hanxiaojun@hit.edu.cn

- Lipid bilayer arrays for membrane protein separation;
- Lipid vesicle/nanotube generation using micro interdigitated electrode;
- · Lipid vesicles for controlled drug release.



Artificial cell membrane including vesicle, tube and bilayer arrays

13-3 14:40-15:00



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Technical Special Session 13 Self-assembled Nanostructures and Nanomaterials and the Application Room 1 14:00–15:40 Wednesday, 7 October Organizer: Mingdong Dong Co-Chair: Lei Liu

13-4 15:00–15:20

Many-body Dispersion Interactions in Self- assembled Monolayers				
Wei Liu School of Materials Science and Engineering, Nar and Technology, China	ijing University of Science			
 Anisotropic many-body effects in self-assembled monolayers; TCNQ and F4TCNQ on graphene; Hybrid organic-inorganic systems. 				

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14-1 14:00-14:20



14-2 14:20-14:40



14-3 14:40-15:00





Technical Special Session 14 Surface Plasmon Photonics Room 2 14:00–15:40 Wednesday, 7 October Organizer: Jingquan Lin Co-Chair: Xinping Zhang



14-4 15:00–15:20



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14-5 15:20-15:40



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Technical Special Session 15 Micro-and Nano-Photonics and Bioapplications Room 3 14:00–15:40 Wednesday, 7 October Organizer: Liwei Liu Co-Chair: Peng Zou

15-1 14:00-14:20



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15-2 14:20–14:40

Synthesis and Characterization of Up-conversion Luminescence of NaYF₄:Yb³⁺, Er³⁺/PVP Nanotubes Peng Zou School of Science, Changchun University of Science and Technology,

- School of Science, Changchun University of Science and Technology, Changchun, Jilin, 130022, China; International Joint Research Center for Nanophotonics and Biophotonics, Changchun, Jilin, 130022, China
- The NaYF₄:Yb³⁺/Er³⁺/PVP up-conversion luminescent nanotubes were synthesized via electrospinning method;
- The diameters of the nanotubes were controlled by the electrospinning voltage;
- Compared with the UC luminescence properties of pure NaYF₄:Yb³⁺/Er³⁺ nanoparticles, the relative intensities of green, blue, and violet to red emissions in NaYF₄:Yb³⁺/Er³⁺/PVP nanotubes were increased.

d emissions increased.

15-3 14:40-15:00



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Technical Special Session 15 Micro-and Nano-Photonics and Bioapplications Room 3 14:00–15:40 Wednesday, 7 October Organizer: Liwei Liu Co-Chair: Peng Zou

15-4 15:00-15:20



15-5 15:20-5:40

Apply Femtosecond Laser Filaments as RF Transmission Line

Yu Ren, Pei Qin, Zichun Li and Liwei Liu School of Science, University of Science and Technology, Changchun

Filamentation of ultra-short laser pulses has been the subject of interest and attracted a great attention of researches both experimentally and theoretically. Transfer of pulsed EM radiation in air using the laser plasma as a guiding structure has been introduced in two kinds of plasma lines. The result show that microwave guiding along single plasma filament transfer over a distance of about 6.5cm and along double parallel lines over a distance of about 8cm, corresponding to a microwave signal intensity enhancement of more than 3-fold and 6-fold over free space.

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Technical Session 16 Nanoelectronics and Nanomagnetics Room 4

14:00–15:40 Wednesday, 7 October Chair: Masashi Kase, Co-Chair: Lijun Xu

16-1 14:00-14:20



16-2 14:20-14:40



16-3 14:40-15:00



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Technical Session 16 Nanoelectronics and Nanomagnetics Room 4 14:00–15:40 Wednesday, 7 October Chair: Masashi Kase, Co-Chair: Lijun Xu

16-4 15:00-15:20



16-5 15:20–15:40

Study on Dispersion of Photonic Crystal Fiber

Lingxiao Fan, Lijun Xu* , Hongxing Cai , Xiuping Sun, Fangzhou Zhao, Zhenjiang Li and Zhenshan Qi School of Science, Changchun University of Science and Technology, Chnia

- Dispersion properties of photonic crystal fiber of fused silica with hexagonally-arranged air holes in its cladding have been investigated by using the finite-difference beam propagation method;
- The dependence of different PCF geometrical parameters namely
 the air-hole diameter and the pitch were carried out in detail.

Notes

Technical Special Session 17 Design and Control of Micro/nano Mechanisms Room 5 14:00–15:40 Wednesday, 7 October Organizer: Yanling Tian Co-Chair: Hongwei Zhao

17-1 14:00-14:20

Stiffness Analysis of Statically Indeterminate Flexure Hinge Structures

Yanding Qin and Xin Zhao Tianjin Key Laboratory of Intelligent Robotics, Institute of Robotics and Automatic Information System, Nankai University, Tianjin 300071, China

- The characteristics of the SIS flexure structures are analyzed;
- The analytical compliance models of two fundamental types of the SIS
- flexure structures are established;
- The characteristics and possible applications of certain types of SIS flexure structures are computationally investigated.



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17-2 14:20–14:40

Research on the Effect of the Corrugated Contact Surface on an Inchworm-type Piezoelectric Rotary Actuator by Finite Element Method Jianping Li, Hongwei Zhao, Xiaoqin Zhou, and Zejun Li School of Mechanical Engineering, Jilin University, China Tao Cui Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Science, China

· An inchworm-type piezoelectric rotary actuator is

- proposed;
- The corrugated contact surface is used in the design of the rotor;
- FEM is utilized to analyze the working performance;
- The contrastive simulations by the FEM indicate that the stepping rotary angle can be improved by almost
- 4 times than the original one.

17-3 14:40-15:00





Simulation results of two different rotors



17-4 15:00–15:20



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17-5 15:20–15:40

Design and Analysis of A High-speed XYZ Nanopositioning Stage

Chunxia Li, Guoying Gu, Meiju Yang, and Limin Zhu State Key Laboratory of Mechanical System and Vibration, School of Mechanical Engineering,

- Shanghai Jiao Tong University, China • A high-speed XYZ stage based on compliant flexure mechanism and piezoelectric stack actuators is
- developed;
 Analytical models of the stage are established and dimensional optimization is performed;

• Finite-element analysis is used to evaluate the performance of the stage



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18-1 14:00-14:20

Moving Trajectory Analysis and Simulation in Atomic Friction for Zigzag and Armchair Lattice Orientation of MoS₂ Meng Li*, Jialin Shi, Lianqing Liu, Ning Xi, Yu Zhang Shenyang Institute of Automation Chinese Academy of Sciences China

- Predict the moving trajectory of the tip for zigzag and armchair orientation;
- Modify and supplement the existing interface interaction potential of MoS₂;
- Prove the validity of friction modeling and feasibility in chirality determination through friction force anisotropy.



Atomic image of MoS₂, inset is the corresponding FFT pattern and exhibit hexagonal configuration

18-2 14:20-14:40

Pneumatic Pump Chip by 3D Printing Technology

Jingyi Wang, Ping Yao, Niandong Jiao, Lianqing Liu State Key Laboratory of Robotics, Shenyang Institute of Automation, CAS, China

Steve Tung



personnel; · Compared with PDMS, the fabrication of the 3D

The micropump is fabricating by 3D printing

technology;



Photograph of 3D printed micropump and inner structure the chip.

18-3 14:40-15:00

Three-level Nanopositi System Design for a Cros system	oning Platform ss-Scale Fast AFM
Han Lu, Yongchun Fang, Xiac	o Ren and Yinan Wu
Institute of Robotics and Automati	ic Information System,
Tianjin Key Laboratory of Intelligent Ro	botics, Nankai Univ., China
 Introduction of a designed three-level nanopositioning platform system based on the newly built cross-scale fast AFM system; A whole image-visual feedback strategy is adopted to achieve cross-scale positioning on Platform 1; Special smooth and less-oscillation rajectories is designed on Platform II; 	Filters I: an experiment A whole image-visual feedback strategy Platers I: membrane in the image strategy Platers I: membrane interview interview membrane interview platers Special smooth and less- oscillation rejectories Platers II: a dra drawn platers A local-line-scan- detecting method
an open-loop local-line-scan-detecting method	Flow chart of three-level
is used on Platform III.	Nanopositioning Platform System

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Technical Special Session 18 3D Printing and AFM-Related Topics Room 6 14:00-15:40 Wednesday, 7 October Organizer: Yongchun Fang Co-Chair: Lianqing Liu



18-4 15:00-15:20

An On-line Scanning Time Al Variable Speed Scanning Me	location based thod for AFMs
Xiao Ren, Yongchun Fang, Han Lu Institute of Robotics and Automatic Information S Tianjin, 300071, China Tianjin Key Laboratory of Intelligent Robotics,	ı, and Yinan Wu System, Nankai University, Tianjin, 300071, China
 Designed for repeated scanning tasks on the sam area; scanning time for each detected point is intelligen allocated; The proposed scanning method can effectively enhance the imaging speed and quality for AFMs 	te ty were and the second seco
	One line topography comparison for scanning tasks of calibration gratings, 10um, 25Hz

Notes.

18-5 15:20-15:40

Deformation of Alginate Hydrogel in 3D Bio-printing

Yanding Qin and Xin Zhao Tianjin Key Laboratory of Intelligent Robotics, Institute of Robotics and Automatic Information System, Nankai University, Tianjin 300071, China

Xizeng Feng State Key Laboratory of Medicinal Chemical Biology, College of Life Science, Nankai University, Tianjin 300071, China.

· Alginate hydrogel, widely utilized in 3D Bio-printing,

- has very poor mechanical strength; The properties of alginate hydrogel is analyzed
- using Finite Element Method;

• The influence of the deformation of alginate hydrogel on the accuracy of printed objects are analyzed.



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Technical Session 19

Nanometrology and Nanocharacterization Room 1 8:00–10:00 Thursday, 8 October Chair: Shulin Sun, Co-Chair: Chunyu Liu

19-1 8:00-8:20



The Analysis of the Effect on the Moth-eye Antireflection Microstructure Shape

Tingting Dong, Yuegang Fu, Lei Zhang and Chi Chen Optical Engineering Dept., Changchun University of Science and Technology, China Huazhong Institute of Electro-Optics--Wuhan National Laboratory for Optoelectronics, Wuhan, Hubei, 430000, China

- The performance of the antireflective moth-eye
- microstructure grating with shape errors is studied;
- Period, groove height and wavelength are considered;
- The effect of the refractive index is studied to choose appropriate material;
- The rigorous coupled-wave analysis method is used to diffraction calculation.

the antireflective conic moth-eye microstructu Notes+

19-3 8:40-9:00



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Technical Session 19 Nanometrology and Nanocharacterization Room 1 8:00-10:00 Thursday, 8 October Chair: Shulin Sun, Co-Chair: Chunyu Liu

19-4 9:00-9:20



19-5 9:20-9:40

Superhydrophobic Surface Transferred from Berberis Leaf using One Step Replication

Feng Zhang, Yingjie Jiang, Zhuhui Wu, Jiajia Song, Chengyun Xu, Zhenwu Shi, Changsi Peng College of Physics, Optoelectronics and Energy & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, China; Key Lab of Advanced Optical Manufacturing Technologies of Jiangsu Province

& Key Lab of Modern Optical Technologies of Education Ministry of China, Soochow University, China,

- A novel superhydrophobic Berberis leaf is used as template for replication molding;
- · One step replication is used to generate
- superhydrophobic PDMS film;
- Water contact angle of 155° is achieved after
- ethanol immersion after replication molding; • Superhydrophobic PDMS film present a certain
- extent of acid/alkali corrosion resistant.



step replication process

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Technical Special Session 20 Nanopore Technology Room 2 8:00-10:00 Thursday, 8 October Organizer: Deqiang Wang, Co-Chair: Wenqiang Lu





Poly(dT)20 with (M113F)7

20-28:20-8:40

Rapid Discrimination of DNA Sequences using an Engineered Nanopore

Cuifeng Ying, Yanxiao Feng, Yuechuan Zhang, Deqiang Wang* Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, Chongqing 400714, China

Xiyun Guan*

Department of Biological and Chemical Sciences, Illinois Institute of Technology, Chicago, IL 60616, United States

Cuifeng Ying, Wenyuan Zhou, Jianguo Tian, School of Physics, Nankai University, Tianjin 300071, China Yuechuan Zhang

University of Electronic Science and Technology of China, Chengdu 611731, China

- · Observation of sub-state current modulation for unlabelled DNA
- translocating through an engineered α-hemolysin nanopore;
- · Identification of the precise sequences of DNA hairpin;
- · Differentiation of DNA length in four-base precise.

20-3 8:40-9:00







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Technical Special Session 20 Nanopore Technology Room 2 8:00-10:00 Thursday, 8 October Organizer: Deqiang Wang, Co-Chair: Wenqiang Lu



20-4 9:00-9:20



20-5 9:20-9:40

Multi-layered Terahertz Polarizer Fabricated by Layerby-layer-sticking

Hongyan Mao and Hongmei Xu International Research Centre for Nano Handling and Manufacturing of china, Changchun University of Science and Technology, China Hongyan Mao, Liangping Xia, Jun Shen, Dongshan Wei, Hongliang Cui and Chunlei Du Key Laboratory of Multi-scale Manufacturing Technology, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China

A new method to fabricate multilayer terahertz polarizer was proposed. The polarizer was composed of metal gratings on polyethylene terephthalate (PET) film by layer-by-layer-sticking. The triple-layer polarizer revealed an average extinction ratio of 75 dB and an average transmittance of 75% in 0.1-2 THz. The polarization uniformity of the polarizer was fine around the diameter region of 42.3 mm.



Terahertz polarizer

Notes_{*}


Technical Session 21 Nanofabrication and Nanoassembly Room 3 8:00–10:00 Thursday, 8 October Chair: Yasuhiko Hayashi, Co-Chair: Weili Lin

21-1 8:00-8:20



21-2 8:20-8:40



21-3 8:40-9:00





Technical Session 21 Nanofabrication and Nanoassembly Room 3 8:00–10:00 Thursday, 8 October

Chair: Yasuhiko Hayashi, Co-Chair: Weili Lin

21-4 9:00-9:20



Notes.

21-5 9:20-9:40



21-6 9:40-10:00







22-1 8:00-8:20





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22-2 8:20-8:40





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22-4 9:00-9:20

Facile Preparation of Anatase TiO ₂ Porous Films with Exposed {001} Nanofacets			
Hangsheng Yang, Jie Di	ng and Xiaobin Zhang		
School of Materials Science and Engine	eering, Zhejiang University, PR China		
 Anatase TiO₂ films with exposed {001} nanofacets up to 76%; The hydrothermal temperature decreased to as low as 130 °C; Key reaction: HF gas and solid 	Amorphous Anatase Exposed (001) F free F free 0-1+01111+ 0-1+0111+ 0-1+011+ 0-1+011+ 0-1+011+ 0-1+011+ 0-1+011+ 0-1+0000000000		
anodic amorphous TiO ₂ ;	ULUSION ULUSION ULUSION		
An enhanced photocatalytic activity for methyl orange degradation.	anne anne anne anne anne anne anne anne		

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22-5 9:20–9:40



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

- Strain-driven self-rolling mechanism of multilayer nanoribbon on Si(100) and Si(111) surfaces;
- Long-range linear elasticity and mechanical instability of self-scrolling binormal nanohelices under a uniaxial load;
- Mechanically tough, elastic and stable rope-like double nanohelices.





23-1 8:00-8:20





Notes.

23-2 8:20-8:40

Nanometer Precision Fabrication for Optical Surfaces. Wifan Dai and Xiaoqiang Peng Dept. Of Mechatronics Engineering, National University of Defense Technology, China The challenges of optical fabrication; technologies: Controllable Compliant Tools Technology; Some fabrication examples; The CCT technologies have provided effective technical support for the significant research projects in China.

23-3 8:40-9:00



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23-4 9:00–9:20



23-5 9:20–9:40



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Technical Special Session 24 Nanomaterials and Emitting Devices Room 6 8:00–10:00 Thursday, 8 October Organizer: Zhipeng Wei Co-Chair: Rui Chen

24-1 8:00-8:20





Notes.

24-2 8:20-8:40





24-3 8:40-9:00





Technical Special Session 24 Nanomaterials and Emitting Devices Room 6 8:00–10:00 Thursday, 8 October Organizer: Zhipeng Wei Co-Chair: Rui Chen

24-4 9:00-9:20





Notes.

24-5 9:20-9:40

Ultraviolet Light Emission in

Nanocrystalline/amorphous Hybrid SnO₂ Thin Films Yongfeng Li and Bin Yao Key Laboratory of Physics and Technology for Advanced Batteries (Ministry of Education), Jilin University, China

Rui Deng

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

- We demonstrate both theoretically and experimentally that ultraviolet photoluminescence and electroluminescence can be recovered and enhanced in wide-bandgap SnO₂ thin films with 'forbidden' energy gaps by engineering their nanocrystalline structures;
- The tailored low-temperature annealing process results in a hybrid structure containing SnO₂ nanocrystals in an amorphous matrix, and ultraviolet emission is observed in such hybrid SnO₂ thin films, indicating that the quantum mechanical dipole-forbidden rule has been effectively overcome;
- Using this approach, we demonstrate the prototypical electrically pumped ultraviolet light-emitting diode based on nanostructured SnO₂ thin films.



24-6 9:40-10:00





General Information

Changchun

Changchun is the capital city of Jilin Province and one of the 15 sub-provincial cities assigned by the State Council. The total area covers 20,604 square kilometers with a metropolitan area of 4,789 square kilometers which includes six administrative districts, three cities, and one town. The total population is 7.67 million of which 3.5 million live in the metropolitan area.

Changchun has become a multi-functional and modern city with numerous reputations such as "The Automotive Capital", "The Hollywood of China", "The City of Organic Food", "The City of Forests", "The City of Science and Education", and "The City of Sculptures". Changchun has won countless awards such as the "2011 Top Ten Low Carbon City", and the "2012 National Cultural City Award". It is also the first to receive the "National Innovative City" award and voted the "City with Most Happiness" and "City Provides Happiness for its Citizens" by the national media and press.

China Optical Science and Technology Museum

China Optical Science and Technology Museum in Changchun is the only national-level museum related to optical science and technology, proposed by Academicians Daheng Wang, Hanggao Ding, Guoguang Mu and Bingkun Zhou, and approved by the Central Government of China in 2007. There are seven main showrooms in the museum with an area of 26000 square meters, which is an important part of the center of science, technology and culture of Jilin province.





Imperial Palace of Manchukuo Museum

The Imperial Palace of Manchukuo Museum was built on the spot where Aisin Gioro Puyi, the last emperor of the Qing Dynasty (1644-1912), lived and is one of China's three existing royal palace relics. It is on the north side of Guangfu Road in Changchun's Kuangcheng district. The museum is a record of the Japanese invasion of Northeast China and turning it into colony and integrates the imperial palace, red tourism, culture, leisure, commerce and services, and is an AAAAA scenic spot. It covers a 250,500-square–meter area with more than 30 scenic spots, including a 47,000-square-meter exhibition site with antiques and other cultural items on display.



Changchun International Sculpture Park

The Changchun International Sculpture Park in the southern part of the city has collected 451 sculptures created by 401 visiting sculptors from 216 countries and regions around the world. In 2005, the Changchun International Sculpture Park was certified as a 4A national tourism attraction by the China National Tourism Administration, and in 2006, it was selected as one of the Top 20 National Park Attractions by the Ministry of Housing and Urban-Rural Development. It is a showcase of the world's sculptures. The collections include Mayan, Eskimoan, Maori, Indo-Europeans, African and Oriental cultures. Together they bear witness to the multi-cultural harmony of the city of Changchun.



Contact Information

Conference Secretariat

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Conference Venue

All sessions will be held at Conference Center of Songyuan Hotel Address: 1169 Xinfa Street, Kuancheng District, Changchun, Jilin Province, China Phone: Pany: +86 18343113013 / Monica: +86 18686300641

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 Changchun's Local Area Code: 431

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