Conference Program

Digest

The 7th International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale

IEEE 3M-NANO 2017

Shanghai, China

7 – 11 August 2017

Organized by:

IEEE Nanotechnology Council

Shanghai Jiao Tong University, China

Changchun University of Science and Technology, China

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

3M-NANO International Society

University of Bedfordshire, UK

Aarhus University, Denmark

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Sponsored by:

National Natural Science Foundation of China

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Research Executive Agency (REA), European Commission

Jilin Provincial Science & Technology Department, China

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 Shanghai at IEEE 3M-NANO 2017 conference!

3M-NANO is an annual International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, held for the seventh time in Shanghai. 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 2017 is proud to offer an excellent technical program containing 18 keynote talks on major conference topics delivered by distinguished researchers and around 180 presentations in parallel technical program.

Dongyuan Zhao

IEEE 3M-NANO 2017, Honorary Chair

Hongjie Dai

IEEE 3M-NANO 2017, Honorary Chair

Kun Qian

IEEE 3M-NANO 2017, General Chair

A major goal of the IEEE 3M-NANO conference is to support a sustainable development of the nanohandling research community and to encourage long-term partnerships and collaborative research activities. To underline this dedication and to provide a get-together forum for all the participants, IEEE 3M-NANO 2017 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 2017. Last but definitely not least, we thank all the conference participants for their support and contribution. We do hope that IEEE 3M-NANO 2017 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 Shanghai!

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Conference Information

Venue and Accommodation

Venue

The Longemont Hotel Shanghai is an international 5-star luxury hotel rising over West Yan An Road and commanding stunning views over the city of Shanghai.

1116 West Yan An Road, Changning District, Shanghai 200052 P.R. China

Phone: +86-21-61159988

Fax: +86-21-61159977

Email: shanghai@longemonthotels.com

Website: www.thelongemonthotels.com

Accommodation

The accommodation of IEEE 3M-NANO 2017 is arranged in the Longemont Hotel Shanghai.

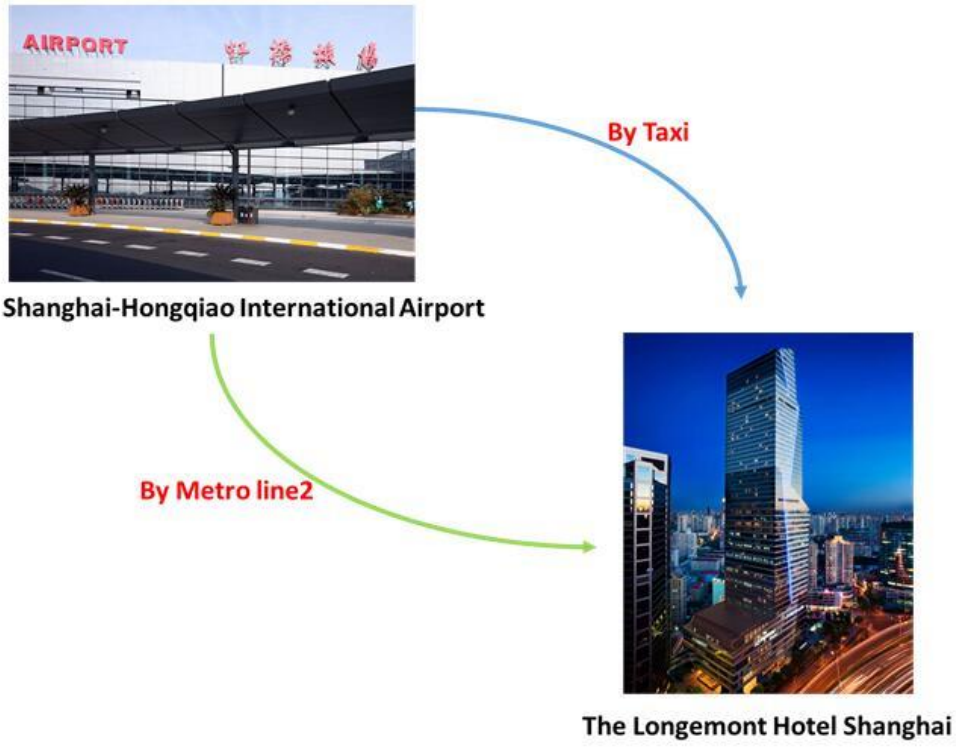
How to get to The Longemont Hotel Shanghai (the venue of IEEE 3M-NANO 2017)

1. **From “Shanghai Pudong International Airport” to “The Longemont Hotel Shanghai”.**

(1) By Taxi (around RMB 200).

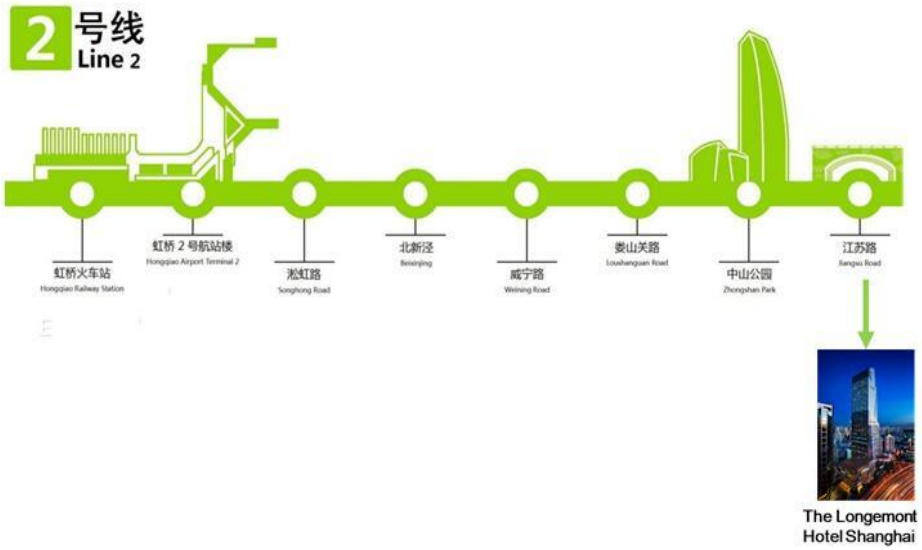
(2) By Shanghai Metro Line 2 (RMB 7).

2. From “Shanghai-Hongqiao International Airport” or “Shanghai Hongqiao Railway Station” to “The Longemont Hotel Shanghai”.

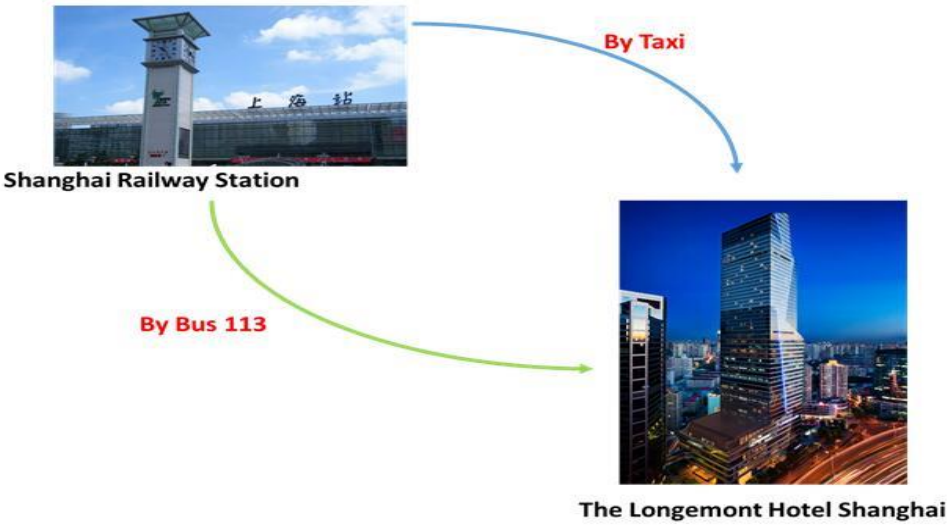


(1) By Taxi (around RMB 50).

(2) By Shanghai Metro Line 2 (RMB 4).



3. From “Shanghai Railway Station” to “The Longemont Hotel Shanghai”.



(1) By Taxi (around RMB 40).

(2) By Bus 113 (RMB 2).

Take bus 113 from “Shanghai Railway Station (South Square)” to “Huashan Road at Jiangsu Road”.

4. From “Shanghai South Railway Station” to “The Longemont Hotel Shanghai”.

By Taxi (around RMB 35).

Shanghai South Railway Station

By Taxi

The Longemont Hotel Shanghai

Floor Maps of Conference Rooms

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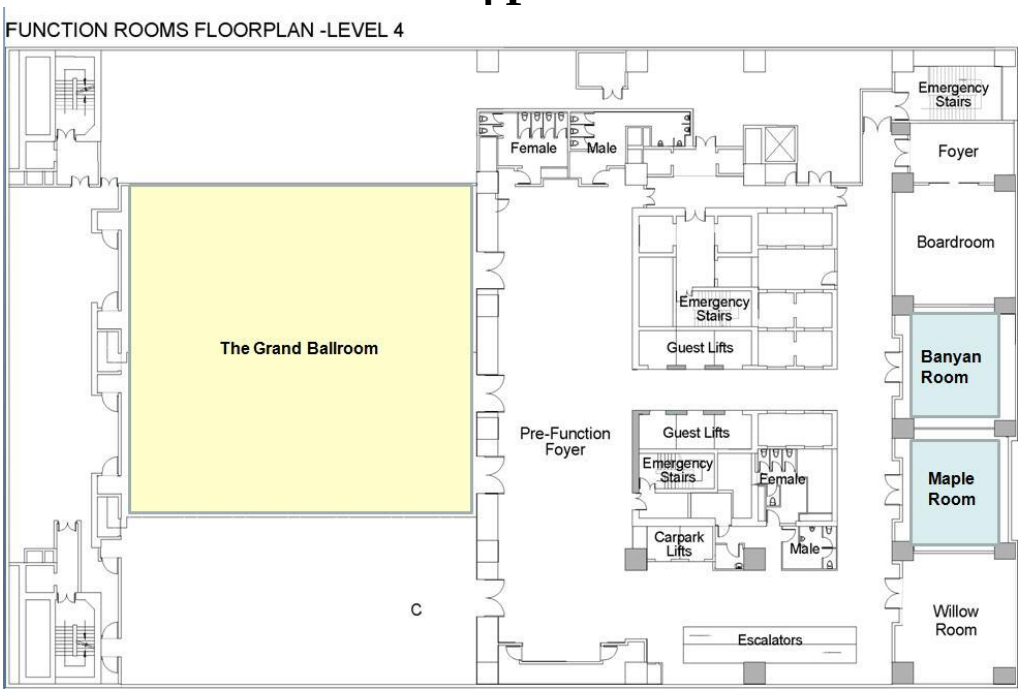

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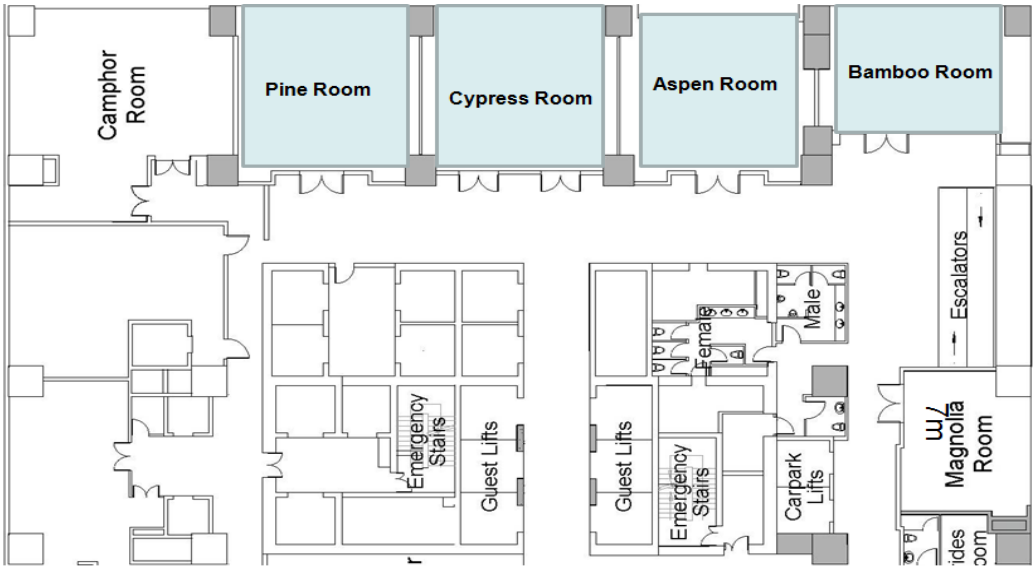

Conference registration will be arranged on the following days:

7 August, 13:00 – 18:00 **The Longemont Hotel, 1F**

8 - 10 August, 09:00 – 17:00 **The Longemont Hotel, 4F**

IEEE 3M-NANO 2017
Program at a Glance

Monday, 7 August, 13:00-18:00, The Longemont Hotel, 1F	
Registration	
Tuesday, 8 August, 8:30-17:00, The Grand Ballroom, 4F	
08:30—08:50	Opening ceremony
08:50—10:10	Keynote reports
10:10—10:30	Break
10:30—12:30	Keynote reports
12:30—14:00	Lunch
14:00—15:20	Keynote reports
15:20—15:40	Break
15:40—17:00	Keynote reports
17:00—20:00	Welcome banquet
Wednesday, 9 August, 8:30-12:10, The Grand Ballroom, 4F	
08:30—10:30	Keynote reports
10:30—10:50	Break
10:50—12:10	Keynote reports
12:10—13:30	Lunch

Wednesday, 9 August, 13:30-17:50, 4-5F	
13:30—15:30	Parallel technical sessions
15:30—15:50	Break
15:50—17:50	Parallel technical sessions
17:50—20:00	Conference dinner
Thursday, 10 August 8:00-12:20, 4-5F	
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, 10 August, 14:00-18:00, The Grand Ballroom, 4F	
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, 11 August, 8:00-16:30	
Social culture activities	

Schedule of the Keynote Reports

Tuesday, 8 August 2017, The Grand Ballroom, 4F

Time	Topic	Speaker
Session Chair: Kun Qian		
08:50 – 09:30	Interfacial Assembly and Engineering of Ordered Functional Mesoporous Materials for Applications	Dongyuan Zhao
09:30 – 10:10	Multifunctional Materials for Emerging Technologies	Federico Rosei
Session Chair: Federico Rosei		
10:30 – 11:10	Microsizing the Mass Spectrometry Analytical Systems	Zheng Ouyang
11:10 – 11:50	Nanophotonic Ion Sources for Trace Analysis and Molecular Imaging by Laser Desorption Ionization Mass Spectrometry	Akos Vertes
11:50 – 12:30	2D Nanomaterials for Biosensing and Theranostics	Dal-Hee Min
Session Chair: Kyle Jiang		
14:00 – 14:40	Mass Spectrometric Study of Electrochemistry	Hao Chen
14:40 – 15:20	The Role of Membrane Curvature at the Nano-bio Interface	Bianxiao Cui
Session Chair: Hao Chen		
15:40 – 16:20	Biomimetic Surface Features for High Performance Air Bearings and Applications	Kyle Jiang
16:20 – 17:00	Publishing in Wiley Materials Science Journals	Jie Cai

Wednesday, 9 August 2017, The Grand Ballroom, 4F

Time	Topic	Speaker
Session Chair: Ricardo Garcia		
08:30 – 09:10	Combining Arrays and Mass Spectrometry for High Throughput Discovery in Chemistry and Biology	Milan Mrksich
09:10 – 09:50	Monitoring Swelling of (Bio)responsive Soft Materials with Nanometer Resolution	Bjørn Torger Stokke
09:50 – 10:30	Short Pulse Laser Processing and Laser Materials Chemistry in Advanced Manufacturing and Medicine	Borislav Lubomirov Ivanov
Session Chair: Milan Mrksich		
10:50 – 11:30	Advanced Scanning Probe Methods for Measurement, Patterning and Device Fabrication at the Nanoscale	Ricardo Garcia
11:30 – 12:10	Intentionally Encapsulated Metal Alloys within Vertically Aligned Multi-walled Carbon Nanotube Array via Chemical Vapor Deposition Technique	Yasuhiko Hayashi

Thursday, 10 August 2017, The Grand Ballroom, 4F

Time	Topic	Speaker
Session Chair: Ivan Buchvarov		
14:00 – 14:40	Graphene based Far-infrared Heating Films	Bunshi Fugetsu
14:40 –15:20	Plasmonic Properties of Single Particle-on-film Nanocavities	Dangyuan Lei
Session Chair: Bunshi Fugetsu		
15:40 – 16:20	Advanced Medical and Material Science Applications based on Mid-IR Tunable Laser System: Tabletop Alternative to the Free-Electron Laser	Ivan Buchvarov
16:20 – 17:00	Design of Analytical Platforms for in Vitro Metabolic Diagnostics	Kun Qian

Keynote Speakers

(in alphabetical order)

Advanced Medical and Material Science Applications based on Mid-IR Tunable Laser System: Tabletop Alternative to the Free-Electron Laser

Ivan Buchvarov

PhD, Associate Professor

Physics Department

Sofia University "St. Kliment Ohridski", Bulgaria

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Abstract: Since the discovery of lasers, they have been viewed as promising instruments for producing specific material states by selective manipulations that could not be realized by conventional incoherent addition of thermal or electronic energy to the material. Although the selective laser chemistry is still a dream, the selective control of material processing done by optimization of laser wavelength, pulse duration, pulse energy per unit area and laser average power is frequently used to move some contemporary technology beyond of its limits. The utilization of the unique mid-infrared (IR) laser radiation in hard and soft tissue and in materials research has produced and identified a wealth of high-impact applications and potential technology breakthroughs in these areas. Until now, mid-IR free-electron lasers are major laser sources which have been successfully used to demonstrate a number of new emerging technologies e.g. surgery with minimal collateral damage-brain surgery, optic nerve sheath fenestration, mid-IR laser enhanced trans-dermal drug delivery, mid-IR laser induced green fluorescence protein gene transfer and laser induced syntheses of new materials. Free-electron lasers are multimillion-dollar facilities with unique pulse characteristics and they are not accessible to the general public. Many of the above applications require optical pulses shorter than the characteristic thermalization time of the material, and pulse energies sufficiently high enough for material ablation. In addition, the average power of the laser has to be large enough to enable “high-throughput” and acceptable product yields.

A portable and cost-efficient alternative to the FEL providing high energy/average power tunable mid-IR radiation can be obtained based on all-solid state laser technology. Using a optical parametric conversion in combination with novel near-IR laser pump source near 1 μm and new non-linear materials we have obtained high-power (>3 W) tunable laser radiation across the peak of the water absorption ~3 μm with an unprecedented energy level (>6 mJ) at a repetition rate of 500-1000 Hz. This laser system promises new capabilities for optimization of surgical treatments because the incision parameters (i.e. ablation profile, collateral cell damage etc.) depend on the structural properties and water content of the tissue. Thus the laser can be used to develop a minimally invasive surgery in a tissue-specific manner. Biocompatibility improvement of biomaterials by texturing with ultra-short laser pulses will be also considered. In addition prospective of development of new methods for laser induced syntheses of super hard materials will be presented.

Mass Spectrometric Study of Electrochemistry

Hao Chen

Professor
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Abstract: Electrochemistry coupled with mass spectrometry (EC/MS) is a powerful means for identifying the products or intermediates of electrochemical reactions, which is not only useful for redox reaction mechanism elucidation but also leads to many valuable bioanalytical applications. The versatility of EC/MS stems from two facts. First, MS can serve as a sensitive and general detector for electrochemical cells and can provide molecular weight information about an analyte of interest. In addition, tandem MS analysis can be used for structural determination based on ion dissociation. Second, electrochemical conversion can improve analyte ionization or provide desired modification to the analyte prior to MS analysis. Attracted by the complementary nature of these two techniques, the marriage of EC and MS appears perfect and appealing. In this talk, I will focus on the development of electrochemical mass spectrometry using ambient ionization methods such as desorption electrospray ionization (DESI) and its applications for proteomics study. The history and future development in this area will be also discussed.

Publishing in Wiley Materials Science Journals

Jie Cai

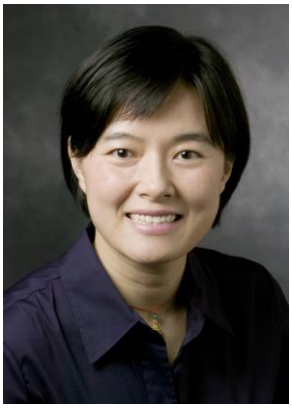
Editor
Wiley
Ph.D
Biomedical Science
Leiden University Medical Center
Netherlands
E-mail: jcai@wiley.com

Abstract: A highly competitive research environment with increasingly limited research funding has created a “Publish or Perish” attitude among scientists who are judged on the quantity rather than quality of their research articles. This presentation provides a brief overview of current trends and challenges in scientific publishing, some ethical considerations, how publishers and authors interact and influence each other, and how the publishing arena is being transformed. Tips will be presented on how to select an appropriate journal for your paper, what aspects of preparation and presentation to focus on from an editor’s and referee’s perspective, and hints for increasing the discoverability of your paper after publication.

The Role of Membrane Curvature at the Nano-bio Interface

Bianxiao Cui

Associate Professor
Department of Chemistry
Stanford University
USA
E-mail: bcui@stanford.edu



Abstract: The interaction between the cell membrane and the contacting substrate is crucial for many biological applications such as medical implants. We are interested in exploring nanotechnology and novel materials to improve the membrane-surface interactions. Recently, we and other groups show that vertical nanopillars protruding from a flat surface support cell survival and can be used as subcellular sensors to probe biological processes in live cells. Vertical nanopillars deform the plasma membrane inwards and induce membrane curvature when the cell engulfs them, leading to a reduction of the membrane-substrate gap distance. We found that the high membrane curvature induced by vertical nanopillars significantly affects the distribution of curvature-sensitive proteins and stimulates several cellular processes in live cells. Our studies show a strong interplay between biological cells and nano-featured surfaces, which is an essential consideration for future development of interfacing devices.

Graphene based Far-infrared Heating Films

Bunshi Fugetsu

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Abstract: Generation, transfer, and use of heat have long been the essential activities over the long history of human civilization. Heat, in ancient times, was obtained entirely by burning the naturally occurred fuels. The burning of fuels generates heat but in the same time produces pollutants to environment. Conversion of electricity in to heat, due to its clean property yet high conversion efficiency, has received high attentions. A certain amount of far-infrared ranged radiative energy is contained in the electricity based heat; transfer and thereby the use of this kind of thermal energy can be performed via thermal radiation. In this study, we used graphene as a convertor for achieving the goal of generation of heat from electricity. Physically exfoliated graphene was dispersed in water at nano-level of dispersion; a certain amount of waterborne polymer based binders was then introduced to create a waterborne type of electric conductive ink. The ink was printed on one side of a PET based film via an intaglio printing process; after curing/drying treatments, graphene has established a continuously interconnected layer with a thickness of about 7 micrometers. Two silver/copper (Ag/Cu) duplicated electrodes were then placed over the graphene layer with a 50 cm distance between the electrodes. The intaglio-printed graphene layer together with the Ag/Cu duplicated two electrodes were finally laminated with another piece of PET film via thermal fusion. Electric resistivity of the intaglio-printed graphene layer was optimized at approximately 30 ohm per centimeter. A voltage of 220 V was applied to the 50 cm distanced electrodes; the intaglio-printed graphene thin layer behaved as an electricity/heat convertor. Its surface temperature elevated from the ambient temperature (about 18 ˚C) to 50 ˚C within 50 seconds and then remained almost unchanged. Electricity had been converted in to heat with a conversion efficiency of 99.2%; moreover, the total resultant heat consisted of 72% the far-infrared ranged radiative energies (wave length, 2~14 micrometers). This value of the electricity/far-infrared energy conversion is about 15% higher than that of the electricity/far-infrared energy converting efficiency observed by using the conventional carbon materials as the electricity/heat convertor at the identical temperatures. A model of "graphene-vibration" under excitation by electricity is proposed to explain the possible mechanism of the far-infrared emission during the electricity/heat conversion. As a novel, efficient, clean, and comfort heating device, the graphene based far-infrared low-temperature heating film can find wide ranges of practical applications, such as houses heating, crops incubating, timbers drying, and industrial products curing, etc.

Advanced Scanning Probe Methods for Measurement, Patterning and Device Fabrication at the Nanoscale

Ricardo Garcia

Professor
Nanoscience and Nanotechnology
Instituto de Ciencia de Materiales de Madrid
CSIC
Spain
E-mail: r.garcia@csic.es

Abstract: The goal of this contribution is to present some recent applications of force microscopy in three areas: imaging 1-2, nanomechanics 2-3 and nanofabrication 4-5. Specifically, the focus will be oriented to applications to study a wide range systems, from biomolecules to polymers to novel 2D electronic materials, in air and liquid environments. The first section provides an introduction to some key aspects of advanced force microscopes. The second section describes some applications to generate high resolution (atomic, molecular or nanoscale) maps of different interfaces from soft matter (polymer and biomolecules) to metal-organic-frameworks. Those maps combine topography and nanomechanical properties. A method to generate three dimensional and atomically-resolved maps of solid-liquid interfaces will be presented. The third section, illustrates how the nanoscale control afforded by scanning probe microscopes has enabled the development of a scanning probe lithography. I will introduce some of its applications in nanopatterning and device fabrication of nanoscale field-effect transistors, quantum dots and biosensors.

Intentionally Encapsulated Metal Alloys within Vertically Aligned Multi-Walled Carbon Nanotube Array via Chemical Vapor Deposition Technique

Yasuhiko Hayashi

Professor
Graduate School of Natural Science and Technology
Okayama University
Japan
E-mail: hayashi.yasuhiko@ec.okayama-u.ac.jp

Abstract: Here we present a growth and characterization of vertically aligned PdxCo1-x alloy encapsulated inside Multi-Walled Carbon Nanotube (MWCNT) arrays on Pd/Co thin layers coated Si substrate by a dc bias-enhanced plasma chemical vapor deposition (CVD) method. The samples were examined using a scanning electron microscope (SEM) and an off-axis electron holograms of individual Metal Alloy Encapsulated within MWCNTs (MAE-MWCNTs) were characterized by transmission electron microscopy (TEM). A vibrating sample magnetometer was used to study the magnetism of the large area MAE-MWCNTs at room temperature. The SEM images show the teardrop-shape particles encapsulated in the tube top of MWCNTs. The hysteresis loop of the ME-MWCNTs shows clear ferromagnetic behavior and the easy axis of magnetization is parallel to the MEA-MWCNT tube axis, as can be elucidated from the large coercive fields and remanence values. Based on electron holography, we have successfully obtained the saturation magnetization of 0.7 T and 1.12 T for the individual isolated MAE-MWCNT with diameters of 41 nm and 83 nm, respectively.

Short Pulse Laser Processing and Laser Materials Chemistry in Advanced Manufacturing and Medicine

Borislav Lubomirov Ivanov

Research Associate Professor
Department of Chemical and Biomolecular Engineering
Vanderbilt University
USA
E-mail: borislav.l.ivanov@gmail.com

Abstract: The aim of this talk is to present short pulse laser processing and laser materials chemistry in advanced manufacturing. Current applications of laser processing mainly use CW laser for cutting, drilling and welding. We will present advanced laser processing review as a laser induced/enhanced processing where the full potential of laser characteristics as pulse duration, pulse energy, repetition rate and wavelength are used in order to control better laser processing and especially to introduce approaches and technologies inaccessible for CW lasers. This includes applications of nano, pico and femtosecond lasers where short pulse duration introduce substantial advantages over CW lasers. Special attention will be taken to consider new processes where combinations of short pulses and specific wavelengths along with laser induced chemical processes can deliver results, which can't be produced from any other technologies. The examples from literature and our own results will cover additive manufacturing/3D printing and some biological applications. With continues increase of the average laser power, improved reliability, decrease price per unit watt and substantially widen laser parameter space the laser technologies became valuable industrial alternative especially in 3D printing and surface modification. Additional example of short pulse laser processing of biological tissue will be presented representing laser surgery as potential final application.

Biomimetic Surface Features for High Performance Air Bearings and Applications

Kyle Jiang

Professor
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Director of Research Centre for Micro/Nanotechnology
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Abstract: Air bearings are used in high speed machines where ball bearings tend to fatigue. They have the advantages of wear free, zero friction, and requiring low maintenance. Air bearings rely on air films to lift a rotating shaft and support it running at high speeds. In our patented static-dynamic dual mode air bearings, the supply of compressed air will be cut and the shaft will suspend itself by forming air films from its rotation, thus the design of air bearings and their lifting capability are vital. To be able to achieve it, our air bearing research extended to the study of dragonfly wings and bumblebee wings, and borrowed their surface structures in our air bearing designs. Both concave and convex microfeatures are placed on air bearing surfaces. The results show an increase of 15% in lifting capability and help air bearings rotate self-sufficient, without the need of air supply.

Plasmonic Properties of Single Particle-on-film Nanocavities

Dangyuan Lei

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Abstract: I will discuss our earlier and recent studies on the light scattering response, photoluminescence and nonlinear optical properties of several plasmonic nanocavities comprised of metal film-coupled nanosphere monomers and dimers. Together with 3D full-wave electromagnetic simulations, the plasmon hybridization theory and multipole expansion model will be used to theoretically understood the observed experimental results such as single-particle scattering, polarization-resolved one-photon and two-photon photoluminescence and second-harmonic generation.

2D Nanomaterials for Biosensing and Theranostics

Dal-Hee Min

Professor
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Korea
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Abstract: New 2D materials with unique physical and chemical property recently attracted much attention in biomedical area for bioimaging, biosensor, drug/gene delivery, and regenerative medicine. Large part of their unique physical and chemical properties are originated from large surface area with extremely high surface to volume ratio in 2D nanomaterials. 2D nanomaterials such as graphene, MoS_2, and MnO_2 are considered as rising stars in nanobiomedicine that would provide solutions for clinical challenges and unmet needs. Here, I will introduce the recent study on the development of biosensor, high-throughput screening assay, and drug delivery system based on 2D nanomaterials.

Combining Arrays and Mass Spectrometry for High Throughput Discovery in Chemistry and Biology

Milan Mrksich

Professor
Weinberg College of Arts & Sciences
Department of Chemistry
Northwestern University
USA
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Abstract: This talk will describe an approach for using mass spectrometry to analyze molecular arrays. The arrays are prepared by immobilizing small molecules, proteins, peptides and carbohydrates to self-assembled monolayers of alkanethiolates on gold. This arrays are then treated with reactants—either chemical reagents or enzymes—and then analyzed using the SAMDI technique to identify the masses of substituted alkanethiolates in the monolayer and therefore a broad range of reactivities and post-translational modifications—including kinase, protease, methyltransferase and carbohydrate-directed modifications—and for discovering chemical reactions. This talk will describe applications to high throughput experiments, including the discovery of reactions, the use of carbohydrate arrays to discover novel enzymes, the preparation of peptide arrays to profile the enzyme activities in cell lysates and high-throughput screening to discover novel reactions and small molecular modulators. These examples illustrate the broad capability of the SAMDI method to profile and discover molecular activities in the molecular sciences.

Microsizing the Mass Spectrometry Analytical Systems

Zheng Ouyang
Professor
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China
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Abstract: Micro- and nano-fabrication has been widely applied for a variety of fields in technology development. While individual components of any given system could be scaled down, the size reduction of an integrated system represents difficulty at a significantly different level. Mass spectrometry serves as a general-purpose analytical and sensing method, with a wide range of applications in biomedicine, food safety and environmental monitoring. The miniaturization of the mass spectrometry (MS) systems has also gone through a process from the shrinking of individual components, with mass analyzers of micrometer sizes fabricated, to the development of integrated small system. Besides the size reduction of the system, the simplification of the analytical procedures also played a crucial role in making the lab analytical technology applicable for on-site, point-of-care detection and quantitation of chemical and bio-markers. The grand strategy for the system development as well as the technical aspects for the instrument size reduction and protocol simplification will be discussed. The future impact by the miniature MS systems will be speculated with convincing demonstrations.

Design of Analytical Platforms for in Vitro Metabolic Diagnostics

Kun Qian
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Shanghai Jiao Tong University
China
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Abstract: Profiling and quantitation of small metabolites are essential for monitoring the physiological and pathological process in bio-systems and can lead to the set-up of new biomarkers benchmark. Despite that mass spectrometry (MS) enjoys huge application benefits over traditional methods, present MS approaches, particularly laser desorption/ionization (LDI) MS techniques, urgently need designed materials as efficient chip platforms and their LDI mechanism is still to be explored, in order to overcome the major limitations in terms of sensitivity, selectivity, throughput, accuracy, and practicability for metabolic diagnostics in clinical laboratory. In this talk, we show our recent progress on the design of hybrid materials as novel chip platforms for LDI MS analysis and their practical application in detection of small metabolites in bio-fluids, for advanced metabolic diagnostics towards large-scale clinical use.

Monitoring Swelling of (Bio)responsive Soft Materials with Nanometer Resolution

Bjørn Torger Stokke
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Biophysics and Medical Technology
Department of Physics
The Norwegian University of Science and Technology
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Abstract: Monitoring swelling of responsive hydrogels at high resolution offer an attractive route to determine hydrogel fundamental properties and their application in development of biosensors. Application of a fiber-optic interferometric platform with 2 nanometer sensitivity for detection of changes in the optical length of various hemispherical ~60 mm radius hydrogels will be highlighted. The characterization method offer high sensitivity potentially supporting detection of minute concentrations of analyte inducing changes in the hydrogel swelling. The generic swelling properties of ionic hydrogels are transformed to biospecific ones by including specific moities that bind, catalyze or induce some reaction, and where these phenomena eventually affect the overall swelling properties. Thus, hydrogels responding to glucose, oligonucleotide based recognition as well as examples where hydrophobic and electrostatic interactions are dominating in changing the swelling state, have been monitored. Continuous monitoring of glucose concentration in physiologically relevant range and temperature are demonstrated exploiting the fiber-optic interferometer. The oligonucleotide based recognition hydrogel comprises hybridized di-oligonucleotides grafted to the polymer network as network junctions in addition to the covalent crosslinks. This supports detection of complementary oligonucleotides or other biological molecules based on their aptamer sequences. Insight into the coupled processes of transport, binding, competitive displacement and swelling in this hybrid hydrogels was obtained using time-lapse confocal imaging. Monitoring the ionic strength dependent swelling of anionic hydrogels after exposure to polycations show that the distribution of the polycations strongly affects the swelling behaviour. For the quantitative interpretation of the swelling behaviour of the hydrogels, finite element modelling indicate that the covalent linkage at the end of the fiber-optic waveguide reduces the swelling capacity compared to unconstrained hydrogels. In conclusion, these results indicate that high resolution optical interferometry, combined with time-lapse confocal microscopy combined with hydrogel design represent a way forward for design of specifically responding materials, the understanding of the cascade of molecular processes occurring when exposed to molecular stimuli, and their application e.g., as biosensors.

Multifunctional Materials for Emerging Technologies

Federico Rosei

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INRS-EMT, Univ. du Quedec
Professor and UNESCO Chair
Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS)
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E-mail: rosei@emt.inrs.ca

Abstract: As the age of fossil fuels is coming to an end, now more than ever there is the need for more efficient and sustainable renewable energy technologies. This presentation will give an overview on recent developments in solar technologies that may address, in part the energy challenge. In particular, nanostructured materials synthesized via the bottom–up approach present an opportunity for future generation low cost manufacturing of devices. We demonstrate various strategies to control nanostructure assembly, to design and synthesize functional materials that will help address the energy challenge. We study, in particular, multifunctional materials, namely materials that exhibit more than one functionality, and structure/property relationships in such systems, including for example: (i) control of size and luminescence properties of semiconductor nanostructures, synthesized by reactive laser ablation; (ii) we devised new strategies for synthesizing multifunctional nanoscale materials to be used for applications electronics and photovoltaics.

Nanophotonic Ion Sources for Trace Analysis and Molecular Imaging by Laser Desorption Ionization Mass Spectrometry

Akos Vertes

Professor of Chemistry
Professor of Biochemistry and Molecular Biology
Founder and Co-director
W. M. Keck Institute for Proteomics Technology and Applications
George Washington University
USA
E-mail: vertes@gwu.edu

Abstract: Silicon nanopost arrays (NAPA) excited by a pulsed laser facilitate the conversion of surface adsorbates to gas phase ions. This laser desorption ionization (LDI) process is driven by the rapid heating of the nanoposts, and the enhanced electromagnetic field around them. Combined with a mass spectrometer for the separation and detection of ions, this platform has been utilized for the analysis of trace level chemicals, and for molecular imaging of thin animal tissue sections. To enhance the ion yields in LDI, we have introduced elevated bowtie antenna array (EBT) nanostructures, where metal bowties sit on top of silicon nanopost pairs. Optimization of this new nanophotonic ion source has resulted in lower fluence threshold for ion production, and a greater control over ion fragmentation. Quantitative response from EBT platforms is advantageous in analytical applications, e.g., in determining the kinetics of biochemical reactions, and in mass spectrometry imaging.

Interfacial Assembly and Engineering of Ordered Functional Mesoporous Materials for Applications

Dongyuan Zhao

Professor
Senior Editor of ACS Central Science
Advanced Materials Laboratory
Department of Chemistry
Fudan University
China
E-mail: dyzhao@fudan.edu.cn

Abstract: With recent progresses made in modern nanoscience and nanotechnology, ordered mesoporous materials have been one of the hottest research topics in scientific community spanned chemistry, materials science, physics and biology. The construction of mesoporous materials is mainly concerned with building monodispersed mesosized (2-50 nm) pore voids and arranging them in a long-range ordered array. Generally, two kinds of templates are used to produce the mesopores: supramolecular aggregates such as surfactant micelle arrays, and rigid preformed solids such as ordered mesoporous silica, carbon, and colloidal crystals. Noticeably, besides the templates, the interface also plays a central role in the synthetic process, because it provides a rich and crucial space for the assembly and construction of mesostructures. Generally, two kinds of interfaces involve in the synthetic system. The first one is at between surfactant templates and guest species, which has been extensively investigated. Another important interface is the two-phase (solid, liquid and gas) one, including liquid-solid, gas-liquid, liquid-liquid, gas-solid, and solid-solid interface, which has been well developed for the synthesis of ordered mesoporous materials. Compared with the one phase synthesis referring to homogeneous nucleation and growth, the introduction of a two-phase interface in the system can change the growth behaviors of mesoporous materials and lead to the formation of molding or multifunctional mesoporous materials. For example, mesoporous thin films or membranes have been widely fabricated on a substrate via an evaporation-induced self-assembly (EISA) method. Multifunctional core-shell structured mesoporous materials can be obtained by rationally depositing mesoporous shells on well-designed cores at the interface. Recently we have developed a novel facile approach i.e. a solvent evaporation-induced aggregating assembly (EIAA) to synthesize large pore mesoporous silica materials. In addition, the well-known hard-templating method for mesoporous materials is also a typical interface reaction.

Technical Program

(ss: Technical Special Session)

Wednesday, 9 August 13:30-15:30, 4-5 F

No.	Room	Session
01	Banyan Room	BioRA (ss)
02	Maple Room	MNR4SCell (ss)
03	Pine Room	Nanobiophotonics (ss)
04	Cypress Room	Mechanical, Tribological and Lubrication Properties of Nanomaterials (ss)
05	Aspen Room	Nanomaterials and Nanostructures for Plasmonics and Light-matter Interactions (ss)
06	Bamboo Room	Sino-Danish Academic Workshop: Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)

Wednesday, 9 August 15:50-17:50, 4-5 F

No.	Room	Session
07	Banyan Room	FabSurfWAR (ss)
08	Maple Room	Low-dimensional Nanomaterials based Ultrafast Photonics (ss)
09	Pine Room	Surface Plasmons and Metamaterial Nanophotonic Devices
10	Cypress Room	Ferroelectrics at Nanoscale：From Fundamentals to Applications (ss)
11	Aspen Room	On-chip Nonlinear Photonics and Quantum Optics (ss)
12	Bamboo Room	Sino-Danish Academic Workshop: Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)

Thursday, 10 August 8:00-10:00, 4-5 F

No.	Room	Session
13	Banyan Room	University of Shanghai Cooperation Organization Nanotechnology (ss)
14	Maple Room	Micro and Nano Engineering for Energy Application (ss)
15	Pine Room	Bottom-up Nanoassembling and Nanomanufacturing using Nanomanipulation based on Functional Materials (ss)
16	Cypress Room	Bio-nanofabrication and Nanocharacterization
17	Aspen Room	Bio-nano Devices and Applications
18	Bamboo Room	Nanomechanics and Nanocharacterization

Thursday, 10 August 10:20-12:20, 4-5F

No.	Room	Session
19	Banyan Room	Design, Analysis and Control of Nano-manipulating Systems (ss)
20	Maple Room	MEMS and Their Applications
21	Pine Room	Nanohandling Robots and Systems
22	Cypress Room	Nanopositioning and Nanomanipulation
23	Aspen Room	Nanomaterials and Nanoassembly
24	Bamboo Room	Nanopore Technology (ss)

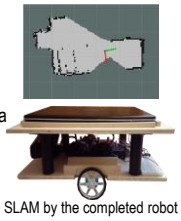
Technical Special Session 01
BioRA (ss)
Banyan Room
13:30–15:30 Wednesday, 9 August
Organizer: Dayou Li
Co-Chair: Renxi Qiu

01-1 13:30–13:50

An implementation of SLAM using ROS and Arduino

Adrián Lendínez Ibáñez, Renxi Qiu and Dayou Li
School of Computer Science and Technology
University of Bedfordshire, Luton, UK

- Explore the Simultaneous Localization and Mapping (SLAM) problem in the context of implementation using the Robot Operating System (ROS) framework and the Arduino technology
- Leads to a simple and cost effective way – including a code base and guidelines - to create robots for 2D mapping using modern technologies such as ROS
- Verified by mapping experiments conducted within domestic environments



SLAM by the completed robot

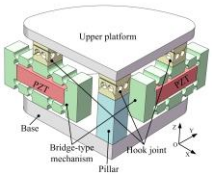
Notes

01-2 13:50–14:10

Design and Modeling of a 2-DOF Decoupled Rotation Platform for Micro-manipulation

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 2-DOF decoupled rotation platform driven by two piezoelectric (PZT) actuators is designed;
- An analytical model of the rotation platform for maximum rotational angle and input stiffness calculation is established;
- Finite element analysis (FEA) is conducted to evaluate the characteristics of the rotation platform .



Mechanism of the 2-DOF decoupled rotation platform

Notes

01-3 14:10–14:30

Detection of Tip Convolution Effects Based on Lateral Force Analysis

Chao Wang and Yongchun Fang
Institute of Robotics and Automatic Information System, Nankai University, China

- Establishing a model between the lateral force and the topography of sample surface
- Analyzing the variation of the lateral force in the tip convolution process
- Using specific images to visually represent the distortion areas
- Performing some experiments to confirm the effectiveness of the presented method

Some experiment results

Notes

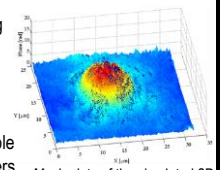
Technical Special Session 01
BioRA (ss)
Banyan Room
13:30–15:30 Wednesday, 9 August
Organizer: Dayou Li
Co-Chair: Renxi Qiu

01-4 14:30–14:50

CARS Detection with Diode Lasers in Digital Holographic Microscopy

V. Sainov, A. Baldzhiev, S. Sainov, K. Kostadinov
Mechatronics Dept., Institute of Mechanics, Bulgarian Academy of Sciences
kostadinov@imbm.bas.bg

- Optical set-up of the diode laser's phase stepping digital holographic microscope (DHM) with CARS attachment for parallel spectral detection at molecule level of the objects is presented.
- Working with low energy CW generating diode lasers in the red and NIR spectral region applicable for non invasive holographic recording and markers free labeling of living cells;
- Phase retrieval algorithms for "real time" holographic recording are developed;
- Experimentally obtained results;



Mesh plots of the simulated 2D CARS signals onto the reconstructed 3D image for the higher threshold level for detection of the CARS signals

Notes

01-5 14:50–15:10

Study of Micromanipulation System for Observing and Positioning Pathological Slides

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

- This paper reported a micromanipulation system for observing and positioning pathological slides.
- The system is capable of image scanning, image mosaicking, and repeated positioning of pathological slides.
- Experimental results show, the system is able to scan and store all the pathological images of a slide (20*mm* × 20*mm*) within 3 minutes, and has 96% success rate of repeated positioning.

Micromanipulation system for observing and positioning pathological slides

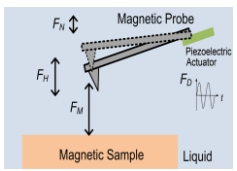
Notes

01-6 15:10–15:30

Effect of Liquid on the Magnetic Force Microscope Imaging

Jinyun Liu, Zhengxun Song and Zuobin Wang
CNM, Changchun University of Science and Technology, China
Renxi Qiu and Dayou Li
IRAC, University of Bedfordshire, Luton, UK

- Investigate the effect of liquid on the parameters of the magnetic probe
- Resonant frequency, amplitude, Q-factor and spring constant were reduced significantly in liquid
- Drive amplitude of the magnetic probe should be increased in liquid
- Appropriate lift height of the magnetic probe should be selected in liquid



Forces of magnetic probe on magnetic sample in liquid

Notes

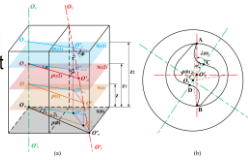
Technical Special Session 02
MNR4SCell (ss)
Maple Room
13:30–15:30 Wednesday, 9 August
Organizer: Yanling Tian
Co-Chair: Hui Xie

02-1 13:30–13:50

A Novel Method for Calibration of Tool Run-out in Micro End-milling

Yudong Zhou, Yanling Tian, Fujun Wang, Xiubing Jing*, Xiang Cai
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China

- A novel method to calibrate the tool run-out in micro end-milling operation was proposed in this work, in which both axes offset and tilt were taken into consideration;
- The proposed method is easy to perform and the run-out calibration process is based on the analysis of the measured contour variations and phase shifts;
- The verification results show that the calibration accuracy is sufficient to capture the tool deviation.



Geometric model of tool run-out with axes offset and tilt: (a) overall view of tool run-out and (b) section view of tool run-out

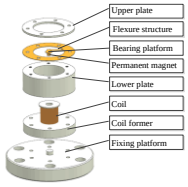
Notes

02-2 13:50–14:10

A Novel Electromagnetic Force Method for Micro/nano Newton Force Measurement

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

- A novel mechanical system is developed for the measurement of micro/nano newton force, as well as the deformation of the suspension mechanism.;
- A null position measurement method for the suspension mechanism is introduced;
- According to the experimental results, the developed system has a current resolution 1mA, electromagnetic force conversion rate 400μN/mA, the stiffness 27.5N/m .



Schematic diagram of the electromagnetic force actuator

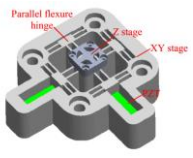
Notes

02-3 14:10–14:30

A Parallel Kinematic Scanner Designed for High-Speed Atomic Force Microscopy

Xianbin He, Kunhai Cai, Yanling Tian, Liangyu Cui
Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, China
Kunhai Cai, Yanling Tian, Xianping Liu
School of Engineering, University of Warwick,UK

- A parallel kinematic piezoelectric actuator (PZT) AFM scanner is designed to achieve high-speed atomic force microscopy (HS-AFM) scanning.
- Finite element analysis (FEA) is adopted to characterize the scanner.
- Images of standard gratings obtained at 25 Hz with our home-made AFM system is presented after calibration and motion coupling compensation.



3D solid model of the scanner

Notes

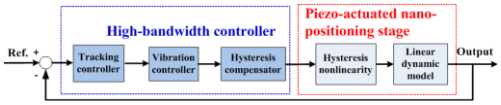
Technical Special Session 02
MNR4SCell (ss)
Maple Room
13:30–15:30 Wednesday, 9 August
Organizer: Yanling Tian
Co-Chair: Hui Xie

02-4 14:30–14:50

Modeling and Control of Piezo-actuated Stages for High-bandwidth Nanopositioning

Guoying Gu
School of Mechanical Engineering, Shanghai Jiao Tong University
Shanghai 200240, China
guguoying@sjtu.edu.cn

- Challenges for High-bandwidth nanopositioning
- Dynamic modeling of piezo-actuated stages involving with the hysteresis nonlinearity
- A three-level control structure for high-bandwidth nanopositioning
- Conclusion and future opportunities



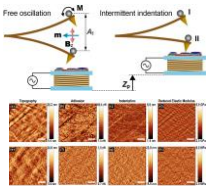
Notes

02-5 14:50–15:10

Magnetic-Drive Peak Force Modulation Atomic Force Microscopy for Nanomechanical Mapping

Xianghe Meng and Hui Xie
State Key Laboratory of Robotics and Systems
Harbin Institute of Technology, China

- A magnetic-drive method for direct bending the cantilever at off-resonance frequencies is developed for nanomechanical mapping.
- This method actuation eliminates all spurious peaks and can overcome the liquid damping.
- This technique allows efficient nanomechanical mapping over a wide range of measurement frequencies and elastic modulus.



Schematic of the system design and experiments

Notes

Technical Special Session 03
Nanobiophotonics (ss)

Pine Room

13:30–15:30 Wednesday, 9 August

Organizer: Jinhua Li

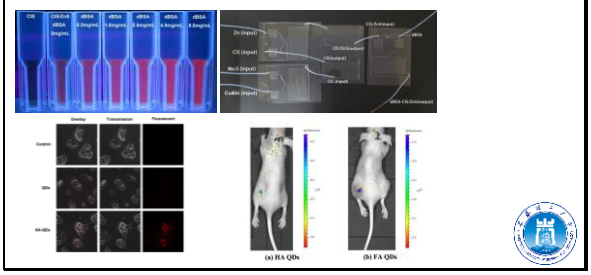
Co-Chair: Gang Chen

03-1 13:30–13:50

The Synthesis and Application of Functional I-III-VI Quantum Dots With Microfluidic Technology

Siyi Hu, Yue Wang, Yingjiao Zhai, Jinhua Li*

School of Science, Changchun University of Science and Technology, Changchun, P.R.China



Notes

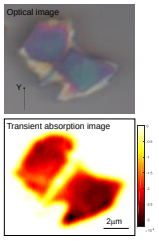
03-2 13:50–14:10

Excited States Dynamic of 2D Nanomaterials Visualized by Transient Absorption Microscopy

Bo Gao

Department of Physics, Harbin Institute of Technology, China

- Transient absorption, combing high spatial resolution and femtosecond temporal resolution, is an extremely flexible and sensitive technique, allowing local detection of tiny 2D nanomaterials.
- Excited states dynamics of single layer graphene and thin layer black phosphorus were interrogated by home-built TAM.
- Substrate and acoustic phonons played an important role in the charge carrier decay dynamics of 2D nanomaterials



Notes

03-3 14:10–14:30

Layer Controlled Fast Direct Growth of Nanographene and Nanographite Film on Non-catalytic Substrates

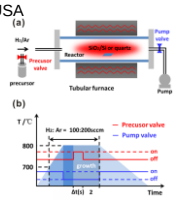
Lei Du, Jiazhen Zhang, Zhiting Hu, Lin Wang, Liaoxin Sun, Gang Chen, Wei Lu

Shanghai Institute of Technical Physics, Chinese Academy of Sciences, China

Liu Yang

Applied Quantum Materials Inc., USA

- We use a specially designed liquid carbon containing precursor to realize fast catalyst-free CVD growth of nanographene and nanographite film on arbitrary substrates such as silicon and quartz at temperature 800℃, which is practical for transfer-free device fabrications and seamlessly compatible with semiconductor technology. Drawing support from an additional system of the ALD technique, we could precisely control the coverage density of nanographene and the thickness of nanographene and nanographite films.



Schematic illustrations of the CVD system and ALD cycle process setup.

Notes

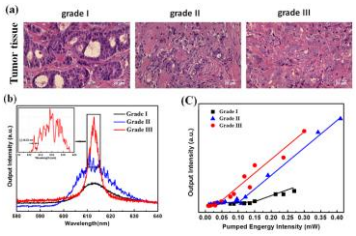
Technical Special Session 03
Nanobiophotonics (ss)
Pine Room
13:30–15:30 Wednesday, 9 August
Organizer: Jinhua Li
Co-Chair: Gang Chen

03-4 14:30–14:50

Random lasing in Human Tissues Embedded with Dyes: A New Spectroscopy for Cancer Diagnosis

Dingke Zhang
School of Physics and Electronic Engineering, Chongqing Normal University

- typical random lasing occurs in cancerous human tissues marked with organic dyes
- more laser resonators in cancerous tissues, caused by more disordered scatters
- random lasing thresholds were found to relate to the tumor grade



The HE stained microscopic image (a), emission spectra (b) and threshold (c) of grade I, II, and III cancerous tissues

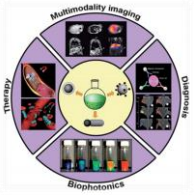
Notes

03-5 14:50–15:10

Janus Nano-platform for Cancer Theranostics

Wen-fei Dong, Juan Yue, Dian Yang and Hao Xing
CAS Key Laboratory of Bio-Medical Diagnostics, Suzhou Institute of Biomedical Engineering and Technology, Chinese Academy of Sciences, Suzhou 215163, China.

- Multifunctional mental-mesoporous silica Janus nanoparticles were developed for synergic therapy and multimodality imaging of liver cancer and achieve most efficient cancer therapy with significantly reduced systematic toxicity.
- Wen-fei Dong conceived and designed the experiments; Juan Yue synthesized the nanoparticles and participated in all experiments; Dian Yang and Hao Xing performed the cell experiments.



Nanoscale, 5, 7664, 2013

Notes

Technical Special Session 04
Mechanical, Tribological and Lubrication Properties of Nanomaterials (ss)

Cypress Room

13:30–15:30 Wednesday, 9 August

Organizer: Hongyu Zhang

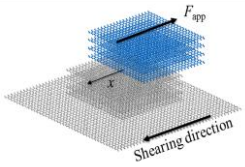
Co-Chair: Yitian Peng

04-1 13:30–13:50

Velocity and Temperature Dependence of Friction in Microscale Graphite

Wen Wang
Department of Mechanical Egnieering, Southwest Jiaotong University, China
Ming Ma
Department of Mechanical Egnieering, Tsinghua University, China
Quanshui Zheng
Department of Engineering Mechanics, Tsinghua University, China

- Interlayer interaction between graphene layers;
- The influence of environment on the static friction in microscale graphite;
- Velocity and temperature dependence of dynamic friction in microscale graphite;



Notes

04-2 13:50–14:10

Achievement of Ultra-low Frictional Interface Combining the FDTS SAMs with Molybdenum Disulfide

Xing'an Cao, Xuehui Gan, Yitian Peng, Yongxia Wang Xingzhong Zeng, and Haojie Lang
College of Mechanical engineering, Donghua University, China

Interfacial friction is of crucial importance to ensure the friction-reducing and anti-wear of mechanical microstructures in micro/nanoelectromechanical systems (MEMS/NEMS). An ultra-low frictional interface combining hydrophobic 1H, 1H, 2H, 2H-perfluorodecyltrichlorosilane(FDTS) self-assembled monolayers(SAMs)-coated AFM tip with mechanically exfoliated molybdenum disulfide (MoS_2) nanosheets deposited on a planar Si/SiO_2 substrate was achieved. The FDTS SAMs/MoS_2 interface exhibits the ultra-low friction force between FDTS SAMs and MoS_2 nanosheets that is independent of the relative humidity. MoS_2 nanosheets exhibit a lower friction force than FDTS SAMs due to its high elastic modulus render small contact area. The ultra-low frictional FDTS SAMs/MoS_2 interface that compose of hydrophobic FDTS and MoS2 nanosheets with incommensurate contact cause the disappearance of sliding potential corrugation, avoiding stick-slip phenomenon. The excellent hydrophobic properties of FDTS SAMs and MoS_2 enable the independence of the relative humidity by preventing the capillary interaction. This study paves the way for extensive applications in friction-reducing of nanoscale contact interfaces.

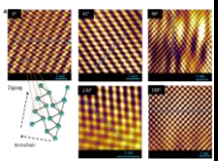
Notes

04-3 14:10–14:30

Black Phosphorus as a New Lubricant

Guoxin Xie, Wei Wang, Ziyi Cui, Dan Guo, Jianbin Luo
State Key Laboratory of Tribology, Tsinghua University, Beijing 100084, China

- Synthesis and modification of black phosphorus(BP);
- Atomic-scale friction anisotropy and potential tunable friction of BP sheets;
- Outstanding lubrication properties of BP nanosheets as water-based and oil-based lubrication additives;
- Remarkable friction properties of BP-based composites



Atomic-scale friction anisotropy of BP

Notes

Technical Special Session 04
Mechanical, Tribological and Lubrication Properties of Nanomaterials (ss)

Cypress Room

13:30–15:30 Wednesday, 9 August

Organizer: Hongyu Zhang

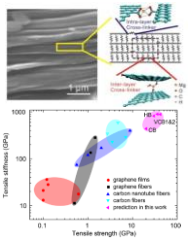
Co-Chair: Yitian Peng

04-4 14:30–14:50

Mechanics of Van der Waals Materials

Yilun Liu and Huasong Qin
State Key Laboratory for Strength and Vibration of Mechanical Structures
School of Aerospace, Xi'an Jiaotong University, Xi'an 710049, China

- Van der Waals materials exhibit extremely anisotropic mechanical properties ;
- A intrinsic buckling mode of van der Waals materials is observed;
- The continuum mechanical model of van der Waals materials is developed by considering local bending energy;
- A deformable tension-shear chain model is proposed to describe the mechanical behaviors of graphene layered materials;



Mechanical properties of graphene paper

Notes

04-5 14:50–15:10

Superlubricity on Microscale

Ming Ma, Quanshui Zheng
State Key Laboratory of Tribology, Center for Nano and Micro Mechanics,
Tsinghua University, Beijing 100084, China
email: maming16@tsinghua.edu.cn

Since the demonstration of superlow friction (superlubricity) in graphite at nanoscale, one of the main challenges is to scale this phenomenon up. On microscale, there are several key issues to be addressed. For example, to determine the critical length of superlubricity, how to achieve superlubricity under ambient condition, and how to achieve robust superlubricity under different loading conditions. Here, we study such problems both from theoretical and experimental sides. Using Frenkel-Kontorova model, we provide an analytical method to estimate the critical length. By combining atomic force microscopy and generalized Langevin equation, we show that one can achieve an atomically smooth surface under ambient condition. We also show that one can control the orientation of sliding surfaces, which is critical for superlubricity. And there is a new running-in mechanism on such scale. These studies are important to achieve robust superlubricity on microscale.

Notes

Technical Special Session 05
Nanomaterials and Nanostructures for Plasmonics and Light-matter Interactions (ss)

Aspen Room

13:30–15:30 Wednesday, 9 August

Organizer: Hua Lu

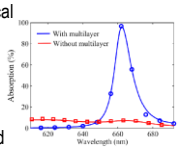
Co-Chair: Yinan Zhang

05-1 13:30–13:50

Low Dimensional Nanomaterials for Novel Photonic Responses

Hua Lu
MOE Key Laboratory of Material Physics and Chemistry under Extraordinary Conditions, and Shaanxi Key Laboratory of Optical Information Technology, School of Science, Northwestern Polytechnical University, Xi'an 710072, China

- We find the strong plasmonic confinement and optical force in spatially separated phosphorene pairs.
- The nearly perfect absorption of light in single-layer MoS_2 are realized in the multilayer photonic structures.
- In a novel plasmonic system, we realize high-Q and flexibly tunable EIT-like effect.
- The results enrich photonic responses and applications of low dimensional materials.



Light absorption in single-layer MoS_2

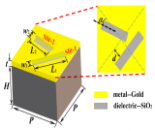
Notes

05-2 13:50–14:10

Plasmonic Lenses based on the Non-parallel Double-slit Metasurface Arrays

Yuying Niu, Hongyan Shao and Jicheng Wang
Department of Opto-electronic Information Science & Engineering
School of Science, Jiangnan University, China

- We design the metalenses with non-parallel double-slit arrays to realize the perfect focusing properties.
- The tunable plasmon induced transparency (PIT) can be realized by graphene-based metasurface arrays.
- The metal/graphene-dielectric Kretschmann/Otto configurations can be used for sensors.
- The micro stereo-lithography technology and electroless to build up the novel 3D plasmonic devices.



The unit cell of metalenses

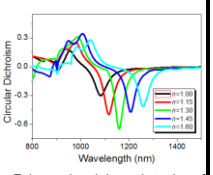
Notes

05-3 14:10–14:30

Enhanced and Dynamic Tuning of Circular Dichroism with Plasmonic Oligomers

Shao-Ding Liu and Jin-Li Fan
Key Lab of Advanced Transducers and Intelligent Control System of Ministry of Education, Taiyuan University of Technology, China

- Generation of strong circular dichrosim with the mulitpolar plasmon resonances
- Enhanced circular dichrosim due to the excitation of lattice plasmon resonances
- The circular dichrosim can be about several times stronger than that of isolated structures
- The circular dichrosim can be dynamic tuned by adjusting the refractive index of the background environments



Enhanced and dynamic tuning of circular dichroism

Notes

Technical Special Session 05
Nanomaterials and Nanostructures for Plasmonics and Light-matter Interactions (ss)

Aspen Room

13:30–15:30 Wednesday, 9 August

Organizer: Hua Lu

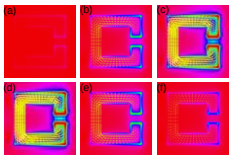
Co-Chair: Yinan Zhang

05-4 14:30–14:50

Boosting Light-matter Interactions in Plasmonic Metamaterials with Photoexcited Graphene

Yuancheng Fan, Quanhong Fu and Fuli Zhang
Department of Applied Physics, School of Science
Northwestern Polytechnical University, Xi'an 710129, China
e-mail: phyfan@nwpu.edu.cn

- We show that the plasmonic excitations can be boosted with photoexcitation in graphene.
- We demonstrate a significantly enhanced magnetic resonance under optical pumping, and remarkable modulations in transmission and absorption.
- The proposed mechanism paves the way toward more efficient control of terahertz waves with many potential applications.



The on-resonance local field and surface current maps of metamaterials for unpumped graphene, and pumped graphene with different quasi-Fermi levels.

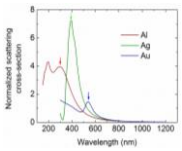
Notes

05-5 14:50–15:10

Ultraviolet Aluminum Plasmonics for Broadband Light trapping in Silicon Solar Cells

Yinan Zhang
Provincial Key Laboratory of Optical Fiber Sensing and Communications, Institute of Photonics Technology, Jinan University, Guangzhou 510632, China

- Light trapping by the aluminum nanoparticles were numerically compared with silver and gold nanoparticles
- Broadband light trapping was achieved by the aluminum nanoparticles
- Aluminum nanoparticles were experimentally fabricated and integrated on the solar cells
- Large photocurrent enhancement was demonstrated



Normalized scattering cross-sections of 100 nm Al, Ag and Au nanoparticle

Notes

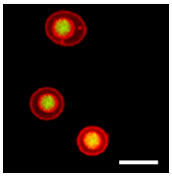
Technical Special Session 06
Sino-Danish Academic Workshop
Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)
Bamboo Room
13:30–15:30 Wednesday, 9 August
Organizer: Mingdong Dong
Co-Organizer: Lei Liu

06-1 13:30–13:43

Artificial Cells

Xiaojun Han
School of Chemistry and Chemical Engineering, Harbin Institute of Technology, 92 West Da-Zhi Street, Harbin 150001, China

- Single compartment GUVs were fabricated using electroformation method
- Multiple compartment GUVs were fabricated using osmotic pressure
- A fissionable artificial eukaryote-like cell model were demonstrated
- Other complicated artificial cells will also be presented



Notes

06-2 13:43–13:56

David Martinez-Martin

Dr

ETH Zürich

Notes

06-3 13:56–14:09

Ami Chand

PhD

Director of Applied Nanostructures

Notes

Technical Special Session 06
Sino-Danish Academic Workshop
Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)

Bamboo Room

13:30–15:30 Wednesday, 9 August

Organizer: Mingdong Dong

Co-Organizer: Lei Liu

06-4 14:09–14:22

Biomolecular Self-assembly Investigated by SPM

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

- High resolution structural imaging for biomolecule self assembly
- Nanomechanical mapping applied in bio-imaging
- Multi-functional SPM applied in polymer and polymer-DNA complex structure

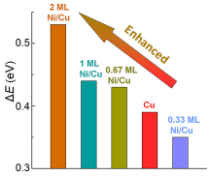
Notes

06-5 14:22–14:35

Enhancing Enantiomeric Separation with Strain: the Case of Serine on Cu(531)

Wei Liu
School of Materials Science and Engineering,
Nanjing University of Science and Technology, China

The separation of enantiomers for chiral molecules is crucial, since enantiomers can present different, and even opposite pharmacological and toxicological properties. Here we find that Cu(531) is an efficient surface to energetically separate serine enantiomers. This higher efficiency is ultimately related to a conformational strain imposed in serine. Motivated by this, we decorated the step sites of Cu(531) with Ni atoms, and showed that serine enantioselectivity increases by 36% as compared to that of the Cu(531).



J. Am. Chem. Soc. 139 (2017) 8167-8173.

Notes

06-6 14:35–14:48

Efficient Catalysts for CO_2 Adsorption, Activation and Photocatalytic Reduction

Yun-Xiang Pan
School of Chemistry and Chemical Engineering, Hefei University of Technology, Hefei, P.R. China

•Creating oxygen vacancies or coating a 5-nm-thick carbon layer on the catalysts promote the photocatalytic reduction of CO_2.

•Biomolecule self-assembled biofilms, with higher conductivity favorable for charge separation and abundant OH/NH_2 groups favorable for CO_2 adsorption, are excellent for the photocatalytic CO_2 reduction.

• Noble-metal-free Mo_2C-based materials are good candidate catalysts for the photocatalytic CO_2 reduction.

Notes

Technical Special Session 06
Sino-Danish Academic Workshop
Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)

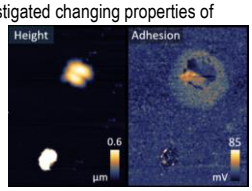
Bamboo Room
13:30–15:30 Wednesday, 9 August
Organizer: Mingdong Dong
Co-Organizer: Lei Liu

06-7 14:48–15:02

Nanomechanics of Bacteria

Hüsnü Aslan and Rikke L. Meyer
iNANO Center, Aarhus University, Denmark

- Bacteria posses different properties when they are attached to surface or freely moving.
- Dynamic nanomechanical mapping by Atomic Force Microscopy provides information beyond structure.
- Using nanomechanical mapping we investigated changing properties of bacteria.
- We show critical steps of bacterial biofilm formation using morphology images and adhesion maps.



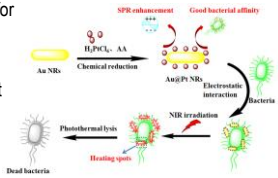
Notes

06-8 15:02–15:16

Pt nanodots Decorated Au Nanorods for Enhanced Photothermal Lysis of Bacteria

Yonghai Feng
Institute for Advanced Materials, Jiangsu University, China

- Photothermal lysis is a good method for killing bacteria in the environment.
- The photothermal efficiency of Au@Pt NRs can be tuned by the Pt nanodot loading.
- Au@Pt NRs facilitated the interaction with bacteria due to the Pt decoration.



Bimetallic Au@Pt nanorods showed enhancement in bacterial affinity and photothermal bactericidal efficiency under NIR irradiation.

Notes

06-9 15:16–15:30

Frequency Shift Raman-based Early Diagnosis of Primary Liver Cancers and Trace Zn(II) Detection in Cellular Media

Wenfeng Zhu, Bochong Tang and **Min Li***
Institute of High Enerage Physics, Chinese Academy of Sciences, China

- Highly sensitive multiplex biomarker detection is critical for the early diagnosis of liver cancer. Plasmonic substrates with nano-printed domains of Raman reporters allow simultaneous detection of various microRNA and alpha-fetoprotein biomarkers with a dynamic range enveloping their typical serum concentrations. Shifts in the reporters SERS spectrum in response to a bound antibody's biomarker recognition constitutes the frequency shift assay, exhibiting here exceptional sensitivity and specificity and shown to function in fetal calf serum and in the serum of a patient with hepatocellular carcinoma. This approach is also applied to measurements of cellular uptake of Zn(II) from the spectral changes for a silver nanoparticle-bound Raman reporter upon Zn(II) chelation.

Notes

Technical Special Session 07
FabSurfWAR (ss)

Banyan Room

15:50–17:50 Wednesday, 9 August

Organizer: Xianping Liu

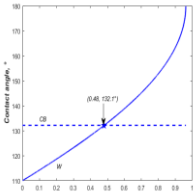
Chair: Wilhelm Pfleging, Co-Chair: Yanling Tian

07-1 15:50–16:05

The Investigation of Equilibrium Contact State of Liquid Droplet on Determined Rough Surfaces

Zhen Yang, Yanling Tian* and Xianping Liu
School of Engineering, University of Warwick, UK

- Rigorous derivations of Young, Wenzel and Cassie-Baxter equations were studied based on Gibbs free energy.
- Flat-top pillars and sinusoidal surface models were established and studied to predict the equilibrium contact state and contact angle.
- The intrinsic hydrophilic and hydrophobic surfaces were also discussed.
- The results indicate that the minima of Gibbs free energy means the stable or metastable state, which has a lower contact angle.



Contact angles *vs* the height of pillars under CB and Wenzel state: θ_Y=110°

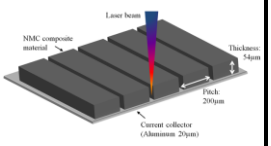
Notes

07-2 16:05–16:20

Laser Micro Structuring of $Li(Ni_{0.6}Mn_{0.2}Co_{0.2})O_2$ Cathode Layers for Lithium-ion Batteries

Jan-Hendric Rakebrandt[1], Peter Smyrek[1,2], Yijing Zheng[1,2], Hans Jürgen Seifert[1], Wilhelm Pfleging[1,2]
[1]Karlsruhe Institute of Technology, IAM-AWP, Germany
[2]Karlsruhe Nano Micro Facility, Germany

- Fs-laser structured and unstructured NMC cathodes were electrochemical analyzed.
- Lithium-ion interfacial kinetics can be increased using 3D electrodes.
- 3D battery concept provides an improved electrochemical performance.
- Insufficient electrolyte wetting in thick film electrodes can be significantly improved.



Schematic view of the laser structuring process of NMC thick film cathodes.

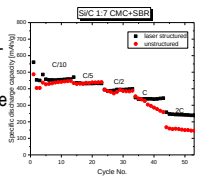
Notes

07-3 16:20–16:35

Silicon-based 3D Electrodes for High Power Lithium-ion Battery

Yijing Zheng[1], Peter Smyrek[1,2], Christian Kübel[1,2]
Jan-Hendric Rakebrandt[1], Hans Jürgen Seifert[1],
and Wilhelm Pfleging[1,2]
[1]Karlsruhe Institute of Technology (KIT), Germany
[2]Karlsruhe Nano Micro Facility (KNMF)

- 3D architecture of Si-based composited electrode materials by ultrafast laser processing
- Generation of free-standing structures on silicon-based composite electrode materials
- Modification of current collector in order to improve the film adhesion
- Significantly improved electrochemical properties at high C-rate by means of 3D architecture



Notes

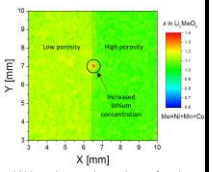
Technical Special Session 07
FabSurfWAR (ss)
Banyan Room
15:50–17:50 Wednesday, 9 August
Organizer: Xianping Liu
Chair: Wilhelm Pfleging, Co-Chair: Yanling Tian

07-4 16:35–16:50

Laser-Induced Breakdown Spectroscopy for Studying the Electrochemical Impact of Porosity Variations in Composite Electrode Materials

Peter Smyrek[1,2], Yijing Zheng[1], Jan-Hendric Rakebrandt[1], Hans Jürgen Seifert[1], and Wilhelm Pfleging[1,2]
[1] IAM-AWP, Karlsruhe Institute of Technology, Germany
[2] Karlsruhe Nano Micro Facility, Germany

- Control of porosity in NMC electrodes by large area embossing
- Laser-Induced Breakdown Spectroscopy (LIBS) was applied for achieving lithium elemental mappings after electrochemical cycling
- Porosity variation may induce cell degradation due to local lithium plating identified by LIBS



Lithium elemental mapping as function of porosity in NMC electrodes

Notes

07-5 16:50–17:05

Lithography-induced Wettability Changes of Silicon

Jiajing Zhu, Yanling Tian, Chengjuan Yang*, Fujun Wang
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, Coventry CV4 7AL, UK

- Three different patterns are fabricated successfully on the silicon wafers by lithography technology;
- The effects of dimension and interval parameters on surface wettability are researched;
- Linear array's CA < Square matrix's & Dot matrix's CA
- The smaller dimension of microstructure have higher contact angle and show better hydrophobic surface, especially when the size is less than 100μm.

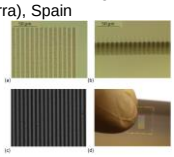
Notes

07-6 17:05–17:20

Ultrafast Laser Inscription of Glass Volume Gratings for Their Use in Optical Applications

Mikel Gomez-Aranzadi, Antonio Dias-Ponte, Ainara Rodriguez, Miguel Martínez-Calderon, Eduardo Granados and Santiago Miguel Olaizola
Additive Manufacturing and Laser Group, Materials and Manufacturing Division, Ceit-IK4 and Tecnun (University of Navarra), Spain

- Volume diffraction gratings were fabricated and the effect of irradiation conditions on their performance analyzed
- Analysis of the refractive index change and the induced birefringence in the material is included
- Gratings were tested and validated for optical applications


Binary polarization grating made in glass, (a) top-view and (b) cross-section (c) between crossed polarizers. (d) Sample of fused silica glass with a 3x6 mm2 polarization grating

Notes

Technical Special Session 07
FabSurfWAR (ss)
Banyan Room
15:50–17:50 Wednesday, 9 August
Organizer: Xianping Liu
Chair: Wilhelm Pfleging, Co-Chair: Yanling Tian

07-7 17:20–17:35

Surface Properties of Graphene Platelets/Nickel Composite Coatings

Meng Li[a], Jian Liu[b*], Xiaoping Zhang[a], Sai Priya Munagala[c], Yaqing Tian[a], Jie Ren[a], Kyle Jiang[a,c*]

[a]Heavy Machinery Engineering Research, Taiyuan University of Science and Technology, China.

[b]School of Manufacturing Science and Engineering, Sichuan University, China.

[c]School of Mechanical Engineering, University of Birmingham, UK.

- The study focusses on the electrodeposition of graphene platelets in Ni matrix
- Characterisation techniques such as SEM, surface roughness, hardness, XRD and surface conductivity were used.
- This work opens a new window of applications and provides a way to improvise Ni components for better.

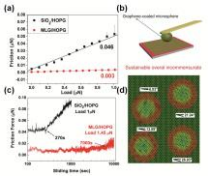
Notes

07-8 17:35–17:50

Measuring Ultralow Friction between 2D Materials by Atomic Force Microscopy

Tianbao Ma
State Key Laboratory of Tribology, Tsinghua University, Beijing 100084 China

- It remains a challenge to measure friction between 2D materials, and obtain long-lasting superlubricity under high applied normal load.
- We report a direct AFM measurement of sliding friction between graphene-coated microsphere (GMS) and graphene, and between GMS and hexagonal boron nitride (h-BN) hetero 2D layers.
- The exceptionally low and robust friction coefficient of 0.003 is obtained in ambient atmosphere, under high local contact pressure.
- This sustainable ultralow friction is attributed to the overall incommensurability of the contact.



Superlubricity of graphene coated microsphere (GMS). (a) Friction-loading curve; (b) Schematic of GMS probe in AFM; (c) Duration of superlubricity; (d). Superlubricity mechanism

Notes

Technical Special Session 08
Low-dimensional Nanomaterials based Ultrafast Photonics (ss)

Maple Room

15:50-17:50 Wednesday, 9 August

Organizer: Xiaohui Li

Co-Chair: Jianfeng Li

08-1 15:50–16:05

Manipulation of Light with Hybrid Plasmonic Modes

Lei Zhang
Key Laboratory for Physical Electronics and Devices of the Ministry of Education & Shaanxi Key Lab of Information Photonic Technique, Xi'an Jiaotong University, Xi'an 710049, China
Email: eiezhanglei@mail.xjtu.edu.cn

Light manipulation at nanoscale opens bright opportunities to explore a mystery territory, however, there are also great challenges in both science and technology. In order to achieve a full control of light at nanoscale, various designs have been demonstrated. The efficiency and feasibility are critical issues to consider. Recently, metasurfaces with improved transmission efficiency have been realized using high-index dielectric structures. The structure size is usually at hundreds of nanometers level. Relatively speaking, plasmonic structures promise unit cells at tens of nanometers level, beneficial for a even compact device design, if with a better efficiency. In this talk, I will present our recent works on the visible light manipulation with hybrid plasmonic modes. By involving complex modes coupling, not only the manipulation efficiency can been improved, the sample fabrication is also easier.

Notes

08-2 16:05–16:20

Ultrashort Pulses with Dynamics States of Polarization From a Nanomaterial Enabled Fiber Laser

Chengbo Mou[1], Tianxing Wang[1], Sergey Sergeyev[2], Aleksey Rozhin[2]
[1]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai University, 200072, Shanghai, P.R.China
[2]Aston Institute of Photonic Technologies (AIPT), Aston University, Birmingham, B4 7ET, United Kingdom

The rapid development of ultrafast photonics imprints significant interests in laser systems emitting ultrashort pulses. Over the past few decades, a majority of research interests have been focused on the improvement of systematic parameters of ultrafast laser systems such as noise, pulse duration, pulse energy, repetition rate etc. These engineering terms become more and more important due to the extensive applications of ultrafast lasers. However, it is more interesting to explore further properties of ultrashort pulses which is believed to pay more contributions to versatile applications of ultrafast photonics. In this review, we will focus on the recent advancement of generation of ultrashort pulses with dynamics state of polarization (SOP). Such phenomenon have been firstly observed from a carbon nanotube facilitated mode locked fiber laser system. Due to the interplay among cavity anisotropy, gain sharing, and nonlinear effects, various dynamic polarization trajectories have been obtained in the form of polarization attractors on the surface of polarization Poincare sphere. This dynamic SOP routing scheme exhibiting regular geometry such as circle, semi-circle, arc, and spiral. This type of dynamics has been identified as slow dynamics due to the clearer longer time scale when compared with the cavity roundtrip time. The experimental observation of such dynamic SOP of ultrashort pulses gain in-depth understanding of a new dimension of ultrashort pulses. It may also challenge the configuration of new type of ultrafast laser system with dynamics SOP output so that fundamentally improve the performance of lasers in applications such as imaging, metrology, machining etc.

Notes

08-3 16:20–16:35

Mode-locked Cylindrical Vector Beam Fiber Laser Based on Carbon Nanotubes

Zuxing Zhang and Hongdan Wan and Yu Cai and Jie Wang
School of Optoelectronic Engineering, Nanjing University of Posts and Telecommunications, Nanjing, China

- Cylindrical Vector Beam, Carbon Nanotubes, Fiber Laser
- We propose and demonstrate cylindrical vector pulse generation from a mode-locked fiber laser with carbon nanotubes as saturable absorber. A mode selective coupler composed of both single-mode fiber (SMF) and two-mode fiber (TMF) is incorporated into the cavity to act as a mode converter from LP01 mode to LP11 mode with broad spectral bandwidth.

Notes

Technical Special Session 08
Low-dimensional Nanomaterials based Ultrafast Photonics (ss)

Maple Room

15:50-17:50 Wednesday, 9 August

Organizer: Xiaohui Li

Co-Chair: Jianfeng Li

08-4 16:35–16:50

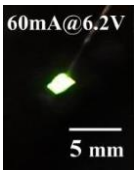
Characterization of Structures and Optical Properties of Er:Ga_2O_3 Thin Films and Light Emission Diodes

Xu Wang, [1*]Ziyang Zhang,[1]Qixin Guo[2]

[1]Suzhou Institute of Nano-Tech and Nano-Bionics, China.

[2]Synchrotron Light Application Center, Saga University, Japan

- Er doped Ga_2O_3 films on sapphire by employing PLD method.
- Green emissions around 550nm can be clearly observed.
- The Er doped Ga_2O_3 light emission diodes were fabricated on p-type Si substrates.
- The driven voltage of Ga_2O_3:Er/Si LEDs is lower than that of ZnO:Er/Si or GaN:Er/Si devices.



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Notes

08-5 16:50–17:05

Enhanced Stability of Stretched-pulse Fiber Laser Incorporating Carbon Nanotubes

Huanhuan Liu

School of Communication And Information Engineering, Shanghai University, Shanghai, China

- saturable abosorber(SA), stretched-pulse fiber laser.
- We have proposed and demonstrated that the stability of stretched pulse can be highly enhanced by incorporating carbon nanotube based saturable absorbers (CNT-SAs). The obtained results can a general guidance for most of all-fiber stretched-pulse laser incorporating nano-material based SAs.

Notes

08-6 17:05–17:20

All Optical Devices based on 2D Materials

Kan Wu

State Key Laboratory of Advanced Optical Communication Systems and Networks, Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China

- 2D materials, phase shifter, switch and modulator.
- 2D materials have attracted wide interest for their abundent optical and electronic properties. We here introduce our recent work on all optical devices including phase shifter, switch and modulator based on 2D materials.

Notes

Technical Special Session 08
Low-dimensional Nanomaterials based Ultrafast Photonics (ss)

Maple Room

15:50-17:50 Wednesday, 9 August

Organizer: Xiaohui Li

Co-Chair: Jianfeng Li

08-7 17:20–17:35

Diverse Multi-soliton Regimes in Tm-doped Mode-locked Fiber Lasers

Jianfeng Li* and Yazhou Wang and Hongyu Luo
State Key Laboratory of Electronic Thin Films and Integrated Devices, School of Optoelectronic Information, University of Electronic Science and Technology of China (UESTC), Chengdu, China

- multi-soliton regimes, mode-locked fiber lasers.
- Here we report four types of multi-soliton regimes in Tm-doped passively mode-locked fiber lasers. The first type is the high repetition rate harmonic mode-locking (HML).The second type is the multi-wavelength mode-locking based on the comb filter effect of a fiber taper.The third regime is the coexistence of dissipative soliton and stretched soliton in a dual-wavelength mode-locked regime.The last is the coexistence of HML and noise-like pulse (NLP) in a dual-wavelength mode-locked regime.

Notes

Technical Session 09
Surface Plasmons and Metamaterial Nanophotonic Devices

Pine Room

15:50-17:50 Wednesday, 9 August

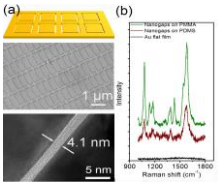
Chair: Wenhao Li, Co-Chair: Hongbing Cai

09-1 15:50–16:10

Fabrication of Highly Dense and Ultra-narrow Nanogaps Array for Flexible SERS Substrate

Hongbing Cai
Hefei National Laboratory for Physical Sciences at the Microscale, University of Science & Technology of China, Hefei 230026, China

- A method for patterning sub-5nm nanogaps array by combining ALD and the lift-off process.
- Precise control of the gap width and morphologies of the outline.
- Surface enhanced Raman scatting (SERS) of molecules positioned in the nanogaps is observed.
- Flexibility of the metal film indicating the potential application of the structure for biosensors and molecular devices.



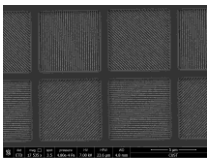
Notes

09-2 16:10–16:30

Fabrication of Division-of-focal-plane Polarizer Arrays by Electron Beam Lithography

Miao Yu, Li Li, Litong Dong, Lu Wang, Xing Chen, Zhengxun Song, Zhankun Weng, Zuobin Wang*
International Research Centre for Nano Handling and Manufacturing of China, Changchun University of Science and Technology Changchun, China

- Aluminum nano-wire grid with four different orientations offset by 45° is fabricated using electron beam lithography (EBL) and inductively coupled plasma-reactive ion etching (ICP-RIE)
- The performance measurement of DoFP arrays is presented
- The extinction ratio is calculated to evaluate the performance of grid polarizers



DoFP polarizer arrays observed by SEM

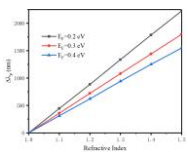
Notes

09-3 16:30–16:50

Tunable Graphene-based Infrared Perfect Absorber for Sensing

Peng Sun, Feng Xia, Lili Liu, Lipeng Jiao, Kai Chen, Meng Li, Qiyong Liu and Maojin Yun
College of Physics Science, Qingdao University, Qingdao 266071, P. R. China

- Propose a perfect absorber composed of periodic double-layer graphene ribbon arrays for infrared sensing.
- The reflection properties is sensitive to the refractive index of the surrounding medium.
- The absorber can be tuned by varying the Fermi energy level of graphene.
- The absorber with high sensitivity can be beneficial for chemical and biosensor applications.



Sensitivity for different Fermi energy levels

Notes

Technical Session 09
Surface Plasmons and Metamaterial Nanophotonic Devices

Pine Room

15:50-17:50 Wednesday, 9 August

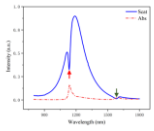
Chair: Wenhao Li, Co-Chair: Hongbing Cai

09-4 16:50–17:10

Twinned Plasmonic Fano Resonances in heterogeneous Au-Ag nanostructure consisting of a rod and concentric square ring-disk

Tongtong Liu, Feng Xia, Wei Du, Kunpeng Jiao, Yusen Shi, Yu Wang, Yang Lu, Mengxue Li and Maojin Yun
College of Physics Science, Qingdao University, Qingdao 266071, P. R. China

- Propose a heterogeneous Au-Ag nanostructure fo Fano resonances.
- Twinned Fano-like dips are observed in the scattering spectra.
- The Fano line width can be reduced to 0.0135 eV.
- The structure can be of much interest in biosensing, detecting and surface-enhanced Raman scattering.



The absorption and scattering spectrum

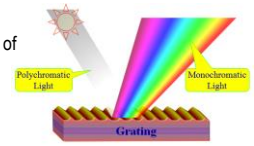
Notes

09-5 17:10–17:30

Fabrication Technology of Large Size Nanometer Precision Diffraction Gratings

Wenhao Li
Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, China

- Diffraction gratings are very popular in spectrum instrument, laser, inertial confinement fusion and so on.
- The precision of the grating ruling machine of CIOMP has reached the world's top level.
- The plane, spherical and aspheric gratings can be designed and manufactured by CIOMP.
- This report will describe the capabilities of CIOMP in diffraction gratings and micro/nano-fabrication.



Principle of grating spectrum

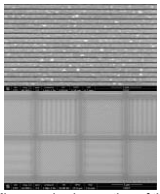
Notes

09-6 17:30–17:50

Fabrication and Evaluation of Aluminum Nano-wire Grid Polarizer Array in Two Different Structure Types

Shuyi Li, Miao Yu, Yinxue Fan, Zhengxun Song*, and Zuobin Wang*
CNM, Changchun University of Science and Technology, China

- Fabrication and evaluation of aluminum nano-wire grid polarizer array;
- Fabricating aluminum nano-wire gird in a single direction structure and a four-direction structure;
- Manufacturing nanowires using EBL (electron beam lithography);
- Manufacturing nanowires using ICP-RIE (inductively coupled plasma-reactive ion etching).



Microscopic observation of the nano-wire grating polarizer

Notes

Technical Special Session 10
Ferroelectrics at Nanoscale：From Fundamentals to Applications (ss)

Cypress Room

15:50–17:50 Wednesday, 9 August

Organizer: Xiangzhong Chen

Co-Chair: Ping Ma

10-1 15:50–16:10

Integration Of Ferroelectric Materials In Micro- And Nanorobots For Chemical And Biomedical Application

Xiangzhong Chen, Marcus Hoop, Fajer Mushtaq, Bradley J. Nelson, Salvador Pané

Institute of Robotics and Intelligent System (IRIS)

Swiss Federal Institute of Technology (ETH) Zurich, Switzerland

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

Notes

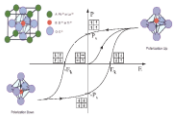
10-2 16:10–16:30

High Energy Density Ferroelectrics

Baojin Chu

CAS Key Laboratory of Materials for Energy Conversion and Department of Materials Science and Engineering, University of Science and Technology of China, Hefei, Anhui Province, China

- Ferroelectrics potentially are dielectric materials of high energy density for capacitor application because of their high dielectric properties.
- The energy storage performance of ferroelectric polymers, ferroelectric ceramics, and nanocomposites was investigated and discussed.
- Different strategies to improve the energy density of polymers, ceramics, and nanocomposites were proposed. The materials with high energy density were designed based on these strategies.



Notes

10-3 16:30–16:50

Large ECE in Relaxor Ferroelectrics, Antiferroelectrics and Multilayer Ceramic Capacitors with Nanosized Structures

Biao Lu, Zhenhua Tang, Dandan Li, Yingbang Yao, Bo Liang, Tao Tao, Shaoping Li, and Shengguo Lu*

Guangdong Provincial Research Center on Smart Materials and Energy Conversion Devices, School of Materials and Energy, Guangdong University of Technology, China

*E-mail: sglu@gdut.edu.cn

- Relaxor ferroelectrics possess nanosized polar domains which are distributed randomly throughout the volume of the material. Thus, the multiple possible orientations of the polar nanosized domains might generate an enhanced electrocaloric effect (ECE) according to recent calculation.
- An antiferroelectric to ferroelectric phase transition will be induced when a large enough electric field is applied. During this process, the reorientation of the two opposite dipoles in a unit cell may lead to a large entropy change.
- Two PLZT compositions ($Pb_{0.89}La_{0.11}(Zr_{0.7}Ti_{0.3})_{0.9725}O_3$ and $Pb_{0.93}La_{0.07}(Zr_{0.82}Ti_{0.18})_{0.9825}O_3$) show relatively large directly measured ECE values, i.e., the electrocaloric strengths ($\Delta T/\Delta E$) are 0.43 and 0.40, which are the largest ones among published data for ceramics.
- Multilayer ceramic capacitors (MLCC) of Y5V type, which are also relaxor ferroelectrics, show a ECE temperature change of 13.9 K which was measured via a differential scanning calorimetry (DSC) method and a reference resistor was used to calibrate the heat flow due to the heat dissipation.

Notes

Technical Special Session 10
Ferroelectrics at Nanoscale：From Fundamentals to Applications (ss)

Cypress Room

15:50–17:50 Wednesday, 9 August

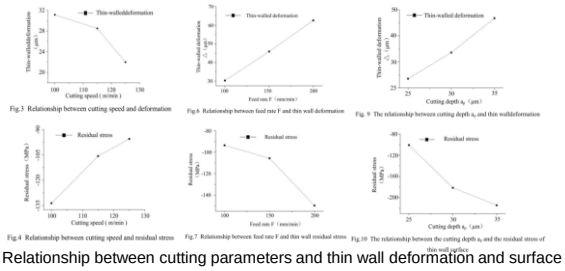
Organizer: Xiangzhong Chen

Co-Chair: Ping Ma

10-4 16:50–17:10

Experimental Study on Cutting Characteristics of Thin Walled Structures with Weak Rigidity

Qimeng Liu, Jinkai Xu and Huadong Yu
College of Mechanical and Electric Engineering Changchun University of Science and Technology Changchun, China



Relationship between cutting parameters and thin wall deformation and surface residual stress

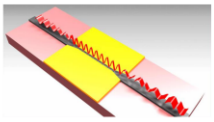
Notes

10-5 17:10–17:30

Functional Thin-Film Ferroelectric Materials for Optical Active Devices

Ping Ma, Jürg Leuthold
Institute of Electromagnetic Fields (IEF)
Swiss Federal Institute of Technology (ETH) Zurich, Switzerland

- Ferroelectric materials exhibiting strong electro-optic effects have attracted increasingly attention as advanced functional materials for silicon photonics.
- The ferroelectric material and device have been properly designed and optimized.
- The ferroelectric material and device manufacturing technologies have been developed.
- A prototyping plasmonic Mach-Zehnder optical modulator applying the developed ferroelectric materials has been realized.



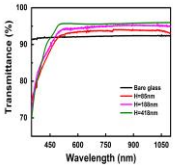
Notes

10-6 17:30–17:50

Fbrication of Submicron Structures on Transparent Quartz Glasses with Improved Optical Properties

Dongyang Zhou, Litong Dong, Ziang Zhang, Mengnan Liu, Ying Wang, Yuegang Fu*, and Zuobin Wang*
CNM & JR3CN, Changchun University of Science and Technology, China
Zuobin Wang
JR3CN & IRAC, University of Bedfordshire, United Kingdom

- Submicron structures were fabricated by two-beam dual exposure laser interference lithography (LIL) and ICP-RIE
- The reflectance of less than 5% and the transmittance of more than 95% were achieved with the submicron structures
- The quartz glasses with the fabricated submicron structures have many applications in optical engineering



Experiment results

Notes

Technical Special Session 11
On-chip Nonlinear Photonics and Quantum Optics (ss)

Aspen Room

15:50-17:50 Wednesday, 9 August

Organizer: Leiran Wang

Co-Chair: Qibing Sun

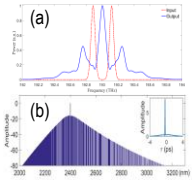
11-1 15:50–16:10

Optical parametric generation & oscillation in nanowaveguides

Leiran Wang[1,2], Wenfu Zhang[1,2], Qibing Sun[1], Mulong Liu[1], Guoxi Wang[1,2], Weiqiang Wang[1], Yishan Wang[1], and Wei Zhao[1,2]

1. State Key Laboratory of Transient Optics and Photonics, Xi'an Institute of Optics and Precision Mechanics of CAS, China
2. University of Chinese Academy of Sciences, China

- Frequency-degenerate parametric generation via IFWM effect in nanowaveguides is demonstrated.
- The robust process with good scalability could find extensive applications in quantum optics.
- A novel dual-pump regime for broadband MIR parametric oscillation in Si microresonators is proposed.
- Such work facilitates the flexible on-chip MIR source that operates at low pump power.



(a) Parametric generation via IFWM effect and (b) Mid-infrared parametric oscillation in nanowaveguides.

Notes

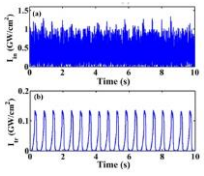
11-2 16:10–16:30

Stochastic resonance in micro-nano structures

Qibing Sun, Wenfu Zhang, Leiran Wang, and Guoxi Wang

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

- Stochastic resonance based on optical bistability in micro-nano structures was demonstrated
- Restoration of signal under high noisy background via stochastic resonance was realized with high cross-correlation gain
- Such a simple and convenient method has potential applications for processing and detecting low-level or noise-hidden signals in various all-optical integrated systems



(a) Noise-hidden signal and (b) output signal

Notes

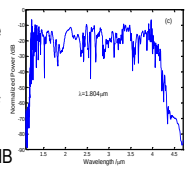
11-3 16:30–16:50

CMOS Compatible On-chip Telecom-band to Mid-infrared Supercontinuum Generation in Dispersion-engineered Reverse Strip/Slot Hybrid Si3N4 Waveguide With Low Cost

Zhanqiang HUI

Xi'an University of Post and Telecommunicaton, CHINA

- A Si3N4 based reverse strip/slot hybrid waveguide with single vertical SiO2 slot is proposed to acquire extremely low and flat chromatic dispersion profile (between ±10 ps •nm-1•km-1) over 610 nm.
- Both the effective area and nonlinear coefficient of the waveguide are investigated.
- An on-chip supercontinuum (SC) source with −30 dB bandwidth of 2996 nm covering from 1.209 to 4.205 μm is obtained based on newly designed waveguide. The optical spectrum and pulse evolution along the designed waveguide are also illustrated.



SCG in the 6 mm reverse waveguide for pump wavelength of 1.804 um

Notes

Technical Special Session 11
On-chip Nonlinear Photonics and Quantum Optics (ss)

Aspen Room

15:50-17:50 Wednesday, 9 August

Organizer: Leiran Wang

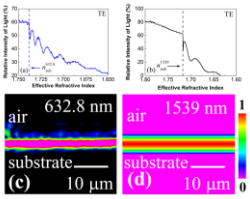
Co-Chair: Qibing Sun

11-4 16:50–17:10

Visible and near-infrared waveguides formed by double-energy proton implantation in magneto-optical glasses

Chun-Xiao Liu
School of Optoelectronic Engineering, Nanjing University of Posts and Telecommunications, China

- (500+550) keV proton implantation with fluences of (1.0+2.0) $\times 10^{16}$ ions/cm^2 is applied to fabricate waveguides.
- Guiding modes have been observed by both the end-face coupling method and the m-line technique.
- The refractive index profile of the waveguide is a typical “optical barrier” distribution.
- The research provides a new way to fabricate waveguide isolators in future.



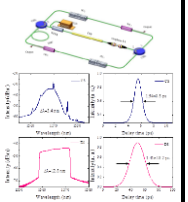
Notes

11-5 17:10–17:30

Conventional and Dissipative Solitons Delivered from a Graphene-Mode-Locked Fiber Laser

Ling Yun
School of Optoelectronic Engineering, Nanjing University of Posts and Telecommunications, China

- We propose a graphene-mode-locked laser that delivers conventional soliton and dissipative soliton.
- The conventional soliton has spectral sidebands with transform-limited pulse duration of 0.8 ps.
- The dissipative soliton exhibits steep spectral edges and strong frequency chirp.
- The pulse duration of dissipative soliton is 18.2 ps.



Optical spectrum and AC trace of CS and DS

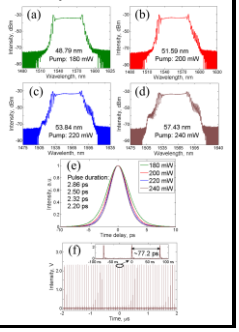
Notes

11-6 17:30–17:50

Sidebands of optical soliton in a dissipative system

Lina Duan
School of Science, Xi’an Shiyou University, China

- Sidebands of optical soliton in a dissipative system was firstly experimentally observed.
- The 57.43-nm spectral bandwidth and 2.20-ps pulse duration were the broadest spectrum and shortest pulse duration in fiber lasers with similar structure.
- Remarkably, there was no evidence of multi-pulse shaping even under excessive pump power.



Notes

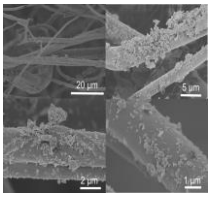
Technical Special Session 12
Sino-Danish Academic Workshop
Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)
Bamboo Room
15:50–17:50 Wednesday, 9 August
Organizer: Mingdong Dong
Co-Organizer: Lei Liu

12-1 15:50–16:05

Pyroelectric and Piezoelectric Effects of Nanomaterials Applied in Capturing Haze Particles

Dr. Li Guan
Renmin University of China

- Characterizations of the nanomaterials with pyro- and piezoelectric effects
- Size and elements analysis of the haze particles captured by the pyro- and piezoelectric filters
- Removal efficiency and lifetime of HAPA filter by using pyro- and piezoelectric materils



Notes

12-2 16:05–16:20

中国建筑科学研究院 China Academy of Building Research

Present Situation of Indoor $PM_{2.5}$, Evaluation Method and Control Technology

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

- Indoor air quality issues in residential and schools has raised great attention in China.
- Method of evaluating indoor air quality is discussed.
- Fresh air purification system is introduced for indoor air pollution control.

Notes

12-3 16:20–16:35

Du Yalan

Dr

Academy of Railway Sciences

Notes

Technical Special Session 12
Sino-Danish Academic Workshop
Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)

Bamboo Room
15:50–17:50 Wednesday, 9 August
Organizer: Mingdong Dong
Co-Organizer: Lei Liu

12-4 16:35–16:50

Huayi Li

Professor

Institute of Chemistry, The Chinese Academy of Sciences (CAS)

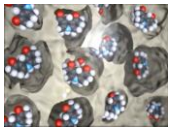
Notes

12-5 16:50–17:05

Nano-porous Material to Provide Innovative Solutions for Air Pollutant Detection and Purification

Frederic Hammel
Ethera, France

- Air pollution becomes a major concern for Human health,
- This nanoscale technology address detection & purification of formaldehyde (carcinogenic indoor air pollutant at very low concentration)
- It opens new air treatment approaches, combining energy efficacy and air quality, especially in schools and green buildings



Notes

12-6 17:05–17:20

Xiaoqing Bai

Dr

Tongji University

Notes

Technical Special Session 12
Sino-Danish Academic Workshop
Micro/nano Structure Measurement and the Application in Bioscience and Environmental Science (ss)

Bamboo Room

15:50–17:50 Wednesday, 9 August

Organizer: Mingdong Dong

Co-Organizer: Lei Liu

12-7 17:20–17:35

Grease, Smoke and Odour Control Solutions for Commercial Kitchens

SiewWei Loke
MayAir Group of Companies, Asia Pacific

- Grease, Smoke and Odour Control Solutions for Commercial Kitchens
- Smoke and Odor Control Strategies for Commercial Dining Area
- You are only 8 Steps Away from Clean, Fresh Smelling and Legally Compliant Premise

MayAir®
Clean Air , Our Future

Notes

12-8 17:35–17:50

Hawk Filtration Technology (Shanghai) Co ,. Ltd

Xuhao Zhu Chairman

- Hawk is a filter manufacturer located in Shanghai Qingpu Industrial Zone.
- Hawk has adequate production, powerful new product developing capacity and strict quality management system.
- There are more than 1000 kinds of major products used on vacuum cleaner, air purifier, HVAC system, automotive air conditioning, power tools, respirator, high speed railway and subway, clean room, etc.

Hawk

Notes

Technical Special Session 13
University of Shanghai Cooperation Organization Nanotechnology (ss)

Banyan Room

8:00–10:00 Thursday, 10 August

Chair: Peng He, Co-Chair: Zhen Zhang

13-1 8:00–8:20

Polyol Synthesis Strategy toward High Aspect Ratio Silver Nanowires through a Metallic and Halide Ions Co-mediated Process

Peng He and Zhao Huang
State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, China

Silver nanowire (AgNW) is one of the most promising candidates for solution based fabrication of high performance flexible electronics, and AgNWs with high aspect ratios are usually preferred to obtain the required properties of the devices. We demonstrate a rapid polyol process to synthesis long AgNWs with high aspect ratios by a combined control of metallic ion (Cu^{2+}) and halide ion (Cl^-/Br^-) concentrations. By separately adjusting the amount of these ions, the nucleation process can be controlled to produce seeds with different morphologies and concentrations, thus determining the final lengths and diameters of the AgNWs and the amount of byproduct particles. We also developed an effective and simple method to separate undesired particles from the solution to obtain highly purified AgNWs. This was achieved by the combination of acetone addition and low speed centrifugation. The AgNWs synthesized from the optimized process were used to fabricate transparent conducting films, and good photoelectric properties was obtained.

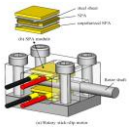
Notes

13-2 8:20–8:40

Development and Analysis of a Tip-separated Flexure Needle based on Piezo Actuation

Bo Zhang, Fangxin Chen, Haiyang Li, Zhijiang Du, and Wei Dong
State Key Laboratory of Robotics and System
Harbin Institute of Technology, Harbin, China, 150080

- Proposed a tip-separated flexure needle based on piezo actuated.
- A macromodel of the needle tip is fabricated to verify the feasibility of the thought.
- The theoretic model of the piezo-actuated tip with external load is established.
- The step loss phenomenon is noteworthy in case of load is employed.



Schenatic view of the rotary stick-slip motor

Notes

13-3 8:40–9:00

Kelvin Probe Microscopy Study of 2D Materials: Interlayer Screening and Electrical Contact Behavior

Chengyan Xu, Yang Li and Liang Zhen
School of Materials Science and Engineering, Harbin Institute of Technology, China

- Kelvin probe microscopy (KFM) is a power tool to measure the spatial charge distribution, work function or surface potential of materials at nanoscale.
- Surface potential measurement of few-layer MoS_2 depicts the layer-dependent work function, revealing the distinct screening effect.
- Through simultaneous surface potential mapping of MoS_2 with a source-drain voltage to two electrodes, the electrical contact behavior between MoS_2 and metal electrodes was unrevealed.

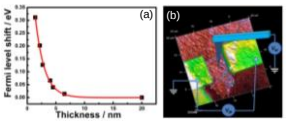


Figure 1. (a) Fermi level shift of MoS_2 nanoflakes as a function of thickness. (b) Schematic of source-drain voltage characteristic of MoS_2 combined with KFM.

Notes

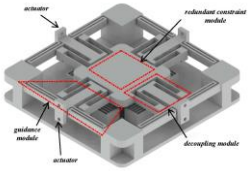
Technical Special Session 13
University of Shanghai Cooperation Organization Nanotechnology (ss)
Banyan Room
8:00–10:00 Thursday, 10 August
Chair: Peng He, Co-Chair: Zhen Zhang

13-4 9:00–9:20

Design and Analysis of a Large-stroke Multi-layer XY Compliant Nanomanipulator of Linear Stiffness

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

- The paper proposes a multi-layer compliant XY nanomanipulator with large stroke (±2×2mm^2) and compact desktop-size
- A spatial redundant constraint module in two layers is proposed to restrict parasitic rotations
- A combination of a Z-shaped beam and multi-beam flexure module is proposed to realize guidance
- Within the designed stroke, the stiffness of the proposed manipulator is linear.



Conceptual design of the proposed XY nanomanipulator

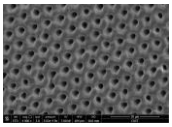
Notes

13-5 9:20–9:40

Surface Texturing on Stainless Steel by Direct Laser Interference Lithography

Wenjun Li, Liang Cao, Qi Liu, Miao Yu, Dayou Li, Zuobin Wang
International Research Centre for Nano Handling and Manufacturing of China
Changchun University of Science and Technology, China
Dong Li
Measuring Science research institute of Jilin Province, China
Jiao Meng
Agricultural Mechanization Sciences of Changchun, China

- A method for the surface texturing of well-designed and highly controllable micro dimple structures on stainless steel by direct laser interference lithography (DLIL) is demonstrated.
- Different exposure durations have been studied to achieve the optimum value of the dimple diameter in order to reduce the friction coefficient of stainless steel.
- The results indicate that the micro circular dimple structures have about 77% reduction of friction coefficient compared with the untreated surfaces.



SEM image of circular dimple structures on 40Cr stainless steel

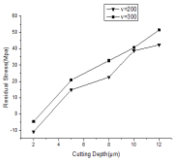
Notes

13-6 9 :40–10:00

Study on Surface Quality of Aluminum Alloy 7075 Precision Micro Cutting

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

- As the cutting speed increases, the machined surface roughness decreases at first and then increases.
- As the cutting depth increases the surface roughness increases gradually.
- The minimum roughness value 0.283μm gotted at the cutting speed 300 mm/s, cutting depth2μm.
- The residual stress change compressive stress into tensile stress when cutting depth greater than 5μm.
- This paper optimized the machining parameters and improve the processing quality.



Influence of cutting depth on residual stress

Notes

Technical Special Session 14
Micro and Nano Engineering for Energy Application (ss)

Maple Room

8:00–10:00 Thursday, 10 August

Organizer: Fei Wang

Co-Chair: Junrui Liang

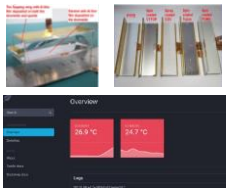
14-1 8:00–8:20

Electret Materials for Enhanced Performance of Triboelectric Energy Harvesting from Wind Flow

Yingchun Wu, Ziyu Huang, Yushen Hu, and Fei Wang

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

- Triboelectric generator base on charged electret film has been optimized with different electret thin films;
- The output power can be enhanced by a negatively charged electret film while weakened by positive charge;
- Self-powered wireless temperature sensor network has been developed which includes energy harvester (E-TriGs), power management chip, MCU, capacitor for energy storage, temperature sensor, transmitter, and receiver.



Energy harvesting device (Top-left) based on different electrets (top-right) for wireless temperature sensing (bottom)

Notes

14-2 8:20–8:40

Design and Test on the Nonlinear Piezoelectric-Electromagnetic Hybrid Energy Harvesting Structure

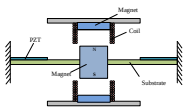
Haipeng Liu

State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, China

Lei Jin and Shiqiao Gao

School of Mechatronical Engineering, Beijing Institute of Technology, China

- A nonlinear PE-EM hybrid harvesting structure is designed and the theoretical model is established.
- The experiment is conducted in order to verify the performance of hybrid harvester.
- The direction and size of magnetic force can influence on the performance of hybrid harvester.
- The designed nonlinear hybrid harvester has good environmental adaptability because the bandwidth increases .



Schematic of nonlinear (PE-EM) hybrid harvesting structure

Notes

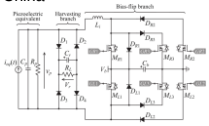
14-3 8:40–9:00

Advanced Power Conditioning Circuits towards Piezoelectric Energy Harvesting Enhancement

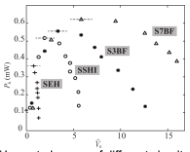
Junrui Liang

ShanghaiTech University, China

- Reviewing the role of power conditioning circuit in piezoelectric energy harvesting systems
- Proposing a general model summarizing the working principle and performance of a majority of existing power conditioning circuits
- Implementing a series of more advanced power conditioning circuits for enhancing the piezoelectric energy harvesting capability



S3BF interface circuit



Harvested power of different circuits

Notes

Technical Special Session 14
Micro and Nano Engineering for Energy Application (ss)

Maple Room

8:00–10:00 Thursday, 10 August

Organizer: Fei Wang

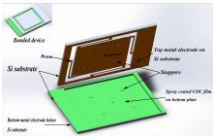
Co-Chair: Junrui Liang

14-4 9:00–9:20

MEMS Electrostatic Energy Harvesting Device With Spray Coated Electret

Anxin Luo, Yixin Xu, Siyan Chen, Hanning Dong, Yulong Zhang and Fei Wang
Department of Electrical and Electronic Engineering, Southern University of Science and Technology, Shenzhen 518055, China

- A spray coated electret based electrostatic energy harvester with out-of-plane gap closing scheme is designed and fabricated.
- An output power of 12 μW is harvested when the resonant frequency is 154 Hz under the acceleration of 28.5 m/s^2. ;
- The device can keep on harvesting power after putting on 100℃ hotplate for 34 hours.



3D Schematic of the electrostatic energy harvester with out-of-plane gap closing scheme

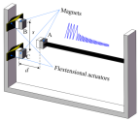
Notes

14-5 9:20–9:40

Magnetically Coupled Flextensional Transducer for Impulsive Energy Harvesting

Hongxiang Zou, Wenming Zhang, Wenbo Li and Guang Meng
State Key Laboratory of Mechanical System and Vibration, School of Mechanical Engineering, Shanghai Jiao Tong University, China
Xinsheng Wei and Sen Wang
Shanghai Aerospace Control Technology Institute, China

- Magnetically coupled flextensional transducer (MCFT) for impulsive energy harvesting is proposed
- The coupled dynamical model is provided to describe the electromechanical transition
- Simulation and experiment results show that the harvester can work effectively under weak impulsive inputs and is reliable and durable under strong impulsive inputs



The schematic of impulsively-excited bistable vibration energy harvester using MCFT

Notes

Technical Special Session 15
Bottom-up Nanoassembling and Nanomanufacturing using Nanomanipulation based on Functional Materials (ss)

Pine Room

8:00–10:00 Thursday, 10 August

Organizer: Irzhak Artemy

Co-Chair: Victor Koledov

15-1 8:00–8:20

Bottom-up Nanoassembling and Nanomanufacturing using Nanomanipulation based on Shape Memory Materials

Victor Koledov[1], A.Zhikharev[1], M.Beresin[2], Peter.Lega[1], N.Kasyanov[1,2], S.von Gratowski[1], N.Sitnikov[1], A.Mashirov[1], V.Shavrov[1], Artemiy Irzhak[2,3]

[1]IRE RAS, Russia

[2]NUST MISIS, Russia

[3]IMT RAS, Russia

- This work is a brief review of composite actuators based on materials with an SME developed by our group, their practical application on nanomanipulation and nanofabrication
- It was demonstrated manipulation of nanoobjects of various nature

Manipulation of nanoobjects of various nature

Notes

15-2 8:20–8:40

High-speed Composite Nanoactuator Based on Ti_2NiCu alloy with SME for Manipulation and Nanoassembly

Dmitry Kuchin, Victor Koledov, Peter Lega and Andrey Orlov

Kotel'nikov IRE RAS, Russia

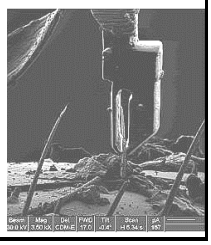
Alexander Shelakov

National Research Nuclear University MEPhI, Russia

Artemiy Irzhak

National Research University MISIS, Russia

- Actuator based on Ti_2NiCu alloy with the shape memory effect (SME) is manufactured and tested
- Completely reversible operation of the actuator is demonstrated at a frequency of 1 kHz
- Partial triggering was observed up to 8 kHz
- Auto-oscillation mode at a frequency of more than 100 kHz was detected



Notes

15-3 8:40–9:00

To the Principal Limitations of Shape Memory Nanotools for Manipulation and Manufacturing

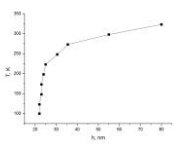
Peter Lega, Dmitry Kuchin, Victor Koledov, Andrey Orlov

Kotel'nikov IRE RAS, Russia

Artemiy Irzhak, Natalya Tabachkova, Nikolay Kasyanov

National Research University MISIS, Russia

- Direct studies of Ti_2NiCu/Pt composite nanoactuators showed that the SME is observed at active layer thickness over 80 nm, and then disappears.
- Nanoactuators with an active layer thickness of less than 100 nm are to be manufactured and the presence of a SME during cooling is checked.
- By observing tapered Ti_2NiCu plates with a thickness of less than 100 nm, that the martensitic transition in the alloy depends both on the temperature and the thickness of plate.



Notes

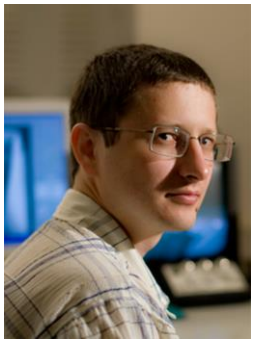
Technical Special Session 15
Bottom-up Nanoassembling and Nanomanufacturing using Nanomanipulation based on Functional Materials (ss)

Pine Room

8:00–10:00 Thursday, 10 August

Organizer: Irzhak Artemy

Co-Chair: Victor Koledov



15-4 9:00–9:20

Magnetic-field-controlled Shape Memory Nanotools for Bio-microtechnology

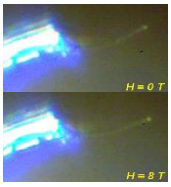
Victor Koledov[1], A.Zhikharev[1], M.Beresin[2], Peter Lega[1], N.Kasyanov[1,2], E.T. Dilmieva[1], S.von Gratowski[1], N.Sitnikov[1], A.Mashirov[1], V.Shavrov[1], Artemy Irzhak[2,3]

[1]IRE RAS, Russia

[2]NUST MISIS, Russia

[3]IMT RAS, Russia

- Magneto-controlled Ni-Mn-Ga / Pt microactuators (20×2×1.5μm) have been studied both by changing the temperature (T= 52-63°C), and by a magnetic field (H=8T)
- Giant (up to 10%) magnetic deformations of alloys with the SME at a constant temperature at the micro- and nanometer-scale sizes opens up new possibilities in microsystem technology, biotechnology, microsurgery



Magnetic-field-controlled bending strain of composite Microactuator (optical image)

Notes

15-5 9:20–9:40

Features and Problems of Real Nanoobjects Manipulating

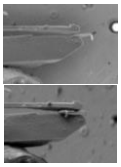
A. Zhikharev, V. Koledov, S.von Gratonsky, V. Kalashnikov, P. Mazaev, V. Shavrov, P. Lega, A. Orlov

•Institute of Radioengineering and Electronics RAS , Russia

A. Irzhak

Institute Of Microelectronics Technology and High Purity Materials RAS, Russia

- Considered the main problems arising from the manipulation of real nanoobjects
- Proposed the basic methods of manipulating 1D and 2D objects
- Considered the main forces of interaction at the nanoscale and ways to neutralize or use them



Tweesers-Nanowire Electrostatic Interaction

Notes

Technical Session 16
Bio-nanofabrication and Nanocharacterization

Cypress Room

8:00-10:00 Thursday, 10 August

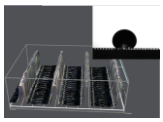
Chair: Peter Smyrek, Co-Chair: Mikel Gomez-Aranzadi

16-1 8:00–8:20

Micro-milling Experimental Study of Aluminum Alloy Hydrophobic Microstructure

Jian Yang
College of Mechanical and Electric Engineering
Changchun University of Science and Technology,China

- Micro-milling machining parameters have a certain effect on surface roughness and surface burrs.
- The contact angle of micro-groove array is 123° in the vertical direction.
- The surface wettability of the material was transformed by hydrophilic to hydrophobic.



Surface morphology of the micro-grooves array

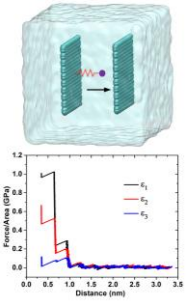
Notes

16-2 8:20–8:40

Computational Simulations of Solvation Force of Water under Different Hydrophobic Interactions

Zhongwu Li, Kun Li, Pinyao He, Kabin Lin, Jingjie Sha and Yunfei Chen
School of Mechanical Engineering, Southeast University, China

- The step-like force oscillatory during the compression indicates that water is squeezed out layer-by-layer.
- The solvation force decreases on increasing the hydrophobicity of the graphene surfaces.
- Surface hydrophobicity would influence the water structure, including concentration and orientation.
- The change of water structure then influence the solvation force of water under nanoconfinement.
- The investigation on surface hydrophobic properties of water-mediated situation will give us some guidance to the future surface modification study.



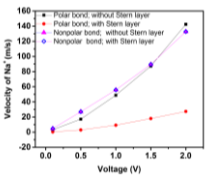
Notes

16-3 8:40–9:00

Anomalous Ion Transport through Hydrophilic and Hydrophobic Nanopores

Kun Li, Zhongwu Li, Kabin Lin, Chen Chen, Pinyao He, Jingjie Sha, Yunfei Chen
Jiangsu Key Laboratory for Design and Manufacture of Micro-Nano Biomedical Instruments, School of Mechanical Engineering,
Southeast University, Nanjing 211189, China

- Ion mobility in a nanopore depended on the surface hydrophobicity of the nanopore material.
- The surface hydrophobicity was regulated by changing the polarity of the Si-N bond and the Van der Waals coefficient.
- The average Na+ velocity in the polar bond nanopore was at least 5 times slower than that in non-polar bond nanopore.



Notes

Technical Session 16
Bio-nanofabrication and Nanocharacterization

Cypress Room

8:00-10:00 Thursday, 10 August

Chair: Peter Smyrek, Co-Chair: Mikel Gomez-Aranzadi

16-4 9:00–9:20

Construction Of Superhydrophobic Surfaces By Sol-gel Techniques

Liang Gu and Yanyan Wang
School of Optoelectronics Information Science and Engineering, Soochow University, China
Changsi Peng
School of Optoelectronics Information Science and Engineering, Soochow University, China

- The rough structure and low surface energy substances of superhydrophobic surfaces
- Effects of various reactants in sol-gel on superhydrophobic properties
- Function of the concentration of fluorosilane on superhydrophobic properties
- Improving the durability of superhydrophobic coatings by sol-gel modification

The static picture of water droplets on superhydrophobic glass

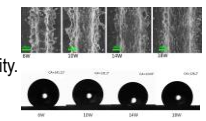
Notes

16-5 9:20–9:40

Fabrication of Size-controlled Micro Morphologies of Hydrophobic Aluminum Alloy Surface based on Nanosecond Laser

Yanling Wan, Lining Xu, Jinkai Xu, Jing Li and Yonghua Wang
College of Mechanical and Electric Engineering, Changchun University of Science and Technology, China

- The width and depth of surface microstructure can be controlled by laser parameters.
- Laser makes the surface of the specimen is deposited by molten slag and obtain hydrophobicity.
- With the increase of microstructure width, the contact angle becomes smaller.
- It can be used to fabricate the special microstructure of hydrophobic surface.



Morphology of micro groove and its corresponding surface contact angle

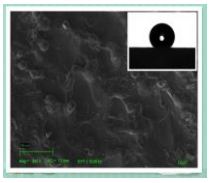
Notes

16-6 9:40–10:00

Orthogonal Experiment on the Preparation of Hydrophobic Ti6Al4V Surface by WEDM

Jinkai Xu, Xuefeng Li, Jingjing Liu, Huadong Yu
School of Mechanical and Electrical Engineering, Changchun University of Science and Technology，China

- A brief introduction to wettability and WEDM.
- Influences of pulse width, number of tubes and feed speed on wettability
- The optimal combination of the pulse width, the power tube and the feed rate



The hydrophobic surface of Ti6Al4V

Notes

Technical Session 16
Bio-nanofabrication and Nanocharacterization

Cypress Room

8:00-10:00 Thursday, 10 August

Chair: Peter Smyrek, Co-Chair: Mikel Gomez-Aranzadi

16-7 Poster 1

Scattering Characteristics of Core/shell Structured Quantum Dots Pumped by Nanosecond Laser Pulses

Yu Chen, Yanxin Yu and Chunyang Wang
School of Electronic and Information Engineering , Changchun University of Science and Technology, China

• This paper reports the simulated scattering characteristics of CdTe/ZnS quantum Dots (QDs) pumped by 532-nm laser pulses based on the simulation and experiment. Comparing to CdTe QDs, the CdTe/ZnS QDs exhibit a red frequency-shift, a lower scattering intensity, but exhibit a nonlinear transmission under 1064-nm nanosecond laser pulses, more chemical/physical stability, the nonlinear transmission is 1.12times than that of CdTe QDs. The energy-dispersive spectroscopy (EDS) data of CdTe/ZnS QDs clearly revealed the Cd, Zn and S components exsit in the CdTe/ZnS QDs.These scattering characteristics of QDs make them find special applications in biosensor and Self-adapted optics .

Notes

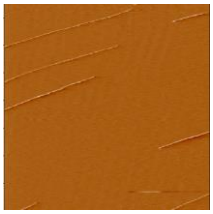
Technical Session 17
Bio-nano Devices and Applications
Aspen Room
8:00-10:00 Thursday, 10 August
Chair: Bin Liu, Co-Chair: Yu Liu

17-1 8:00–8:20

Stretching of DNA Molecules on Mica Surfaces by Magnetic Field

Feifei Wang, Ying Wang, Tingting Huang, Fenfen Guo, Jinyun Liu, Zhengxun Song, Zhankun Weng*, and Zuobin Wang*
CNM, Changchun University of Science and Technology, China

- The DNA molecules were stretched on mica surfaces by magnetic field
- The magnetic fields with different intensities were generated using a cylindrical coil
- The magnetic field intensity was controlled by the electric current flowing through the coil
- The method has its potential for applications such as DNA sequencing and gene editing



AFM images of DNA molecules stretched on mica surfaces in the magnetic fields

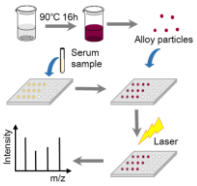
Notes

17-2 8:20–8:40

Analysis of Small Metabolites using Novel Alloy Nanoparticles

Jingyi Huang, Deepanjali D. Gurav, Xiang Wei, Lin Huang, Xuming Sun, Shu Wu, Haiyang Su, Kun Qian*
Center for Bio-Nano-Chips and Diagnostics in Translational Medicine, School of Biomedical Engineering, Shanghai Jiao Tong University

- A new particle assisted laser desorption/ionization mass spectrometry method.
- Analysis of small metabolites in serum samples.
- High sensitivity ~nmol, low sample consumption of ~ 10 nL.
- easy sample treatment in clinics.



Scheme 1.Schematic diagram of particle assisted LDI MS analysis.

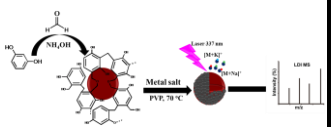
Notes

17-3 8:40–9:00

Polymer-metal Composites for Sensitive Detection of Metabolites by Mass Spectrometry

Yiyi Cheng, Deepanjali Dattatray Gurav, Xuming Sun, Ru Zhang, Wei Xu, Lin Huang, Kun Qian*
School of Biomedical Engineering, Shanghai Jiao Tong University, China.

- Used core-shell construction and polymer core as matrix.
- High sensitivity of MALDI-MS detection.
- Great contribution to amino acids detection.



Schematic illustrations of LDI MS analysis of small molecules as demonstrated in our approach

Notes

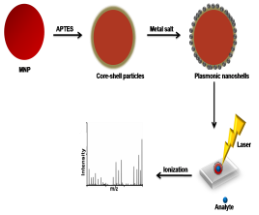
Technical Session 17
Bio-nano Devices and Applications
Aspen Room
8:00-10:00 Thursday, 10 August
Chair: Bin Liu, Co-Chair: Yu Liu

17-4 9:00–9:20

Lipidomics Study using Novel Plasmonic Nanoshells

Jun Liu, Deepanjali Dattatray Gurav, Ru Zhang, Kun Qian*
Center for Bio-Nano-Chips and Diagnostics in Translational Medicine, School of Biomedical Engineering, Shanghai Jiao Tong University

- Novel plasmonic nanoshell matrix for efficient lipid detection.
- Sensitive detection of lipids in serum.
- High sensitivity and low sample volume.
- Facile sample preparation for disease diagnostic application.



Schematic illustration of LDI MS analysis of lipids

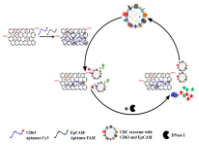
Notes

17-5 9:20–9:40

DNase I Enzyme-aided Signal Amplification based on Graphene Oxide for the Detection of Cancer Exosomes

Zhipeng Huang, Hui Chen, Jilie Kong
Department of Chemistry, Fudan University, Shanghai, China
Hui Wang, Tengda Li, Anmei Deng
Department of Laboratory Diagnosis, Changhai Hospital, Second Military Medical University, Shanghai, China.

- DNase I aided fluorescence amplification based on graphene oxide (GO)-DNA aptamers interaction for colorectal cancer (CRC) exosome detection.
- Exosome has proved to be a potential biomarker and the limit of detection is 2.1×10^4 particles/μl.
- This method was verified in 19 clinical blood serum samples to distinguish healthy and CRC patients.



Scheme of Exosome Detection

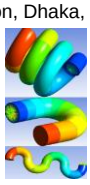
Notes

17-6 9:40–10:00

Fluidic Simulation and Analysis of Spiral, U-shape and Curvilinear Nano Channels for Biomedical Application

Muhammad Javaid Afzal, Shahzadi Tayyaba, Muhammad Waseem Ashraf, M. Khalid Hossain, Fazal-e-Aleem and Nitin Afzulpurkar
University of Lahore, Lahore, Pakistan, GC University Lahore, Pakistan, Bangladesh Atomic Energy Commission, Dhaka, Bangladesh, AIT, Bangkok, Thailand

- This study presents ANSYS simulations for the study of blood flow in tortuous veins.
- Three different nanochannels have been simulated for flow rate and velocity.
- Fluid viscosity is found reduced at nano level and no Dean Flow is observed.



Spiral, U and Curvilinear Nanochannels

Notes

Technical Session 18
Nanomechanics and Nanocharacterization
Bamboo Room
8:00-10:00 Thursday, 10 August
Chair: Lingbao Kong, Co-Chair: Wei Wu

18-1 8:00–8:20

Nanomechanical Properties of Elytra Derived from Irreversible and Reversible Color-changing Beetles

Jiyu Sun[1], Wei Wu[1], Chunxiang Pan[2], Ruijuan Du[1], Zhijun Zhang[3]*
[1] Key Laboratory of Bionic Engineering, Jilin University
[2] Department of Aircraft and Powertrains, Aviation University of Air Force
[3] School of Mechanical Science and Engineering, Jilin University
Changchun, P.R. China

- Irreversible color change of *Harmonia axyridis Pallas* is related to pigments and microstructures of cuticle.
- Reversible color change of Dynastes tityus mainly results from water absorption with sponge structure.
- Nanomechanical properties of two kinds of beetle elytra have relationship with their compositions and microstructures.
- This study helps to get insight into biological functionality and inspire the bionic materials designs.

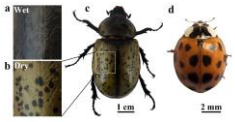


Figure The elytron of Dynastes tityus changes color from deep-brown (a) to yellow-green (b) reversibly. Photos of Dynastes tityus (c) and Harmonia axyridis Pallas (d).

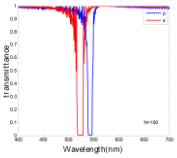
Notes

18-2 8:20–8:40

Narrow-band and Polarization Cut-off Filtering Based on the Bionic Structure of Unidirectional Microvilli Array

Qifan Zhu, Zhiying Liu, Yuegang Fu, Yanchun Hao
Optical Testing and Analysis Center,
Changchun University of Science and Technology, China

- Building the bionic model based on the unidirectional microvilli array
- Simulating the bionic model with effective medium theory and transfer matrix method
- The bionic model achieve the function of double narrow-bands and polarization cut-off filtering
- Changing the size of bionic model could change positions of the double narrow spectrum bands



Narrow-band and polarization cut-off filtering

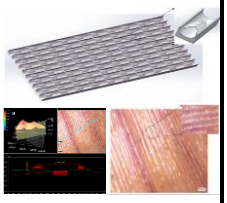
Notes

18-3 8:40–9:00

A Study of Functional Micro/nano Structural Surfaces in Bionic Applications

Zhenzhen Xu and Lingbao Kong*
Shanghai Engineering Research Center of Ultra-Precision Optical Manufacturing, Fudan University, China

- Preliminary research on functional micro/nano structural surfaces was conducted .
- Existing functional structural surfaces are reviewed and classified into three categories.
- Mechanism of unidirectional liquid spreading without extra energy input on the peristome surface of Nepenthes alata was investigated.
- Simplified structures are designed to achieve the function of liquid-oriented transport based on the theoretical analysis.



The model and the optical image of the structure of the peristome

Notes

Technical Session 18
Nanomechanics and Nanocharacterization

Bamboo Room

8:00-10:00 Thursday, 10 August

Chair: Lingbao Kong, Co-Chair: Wei Wu

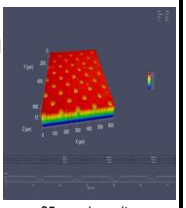
18-4 9:00–9:20

Study on Wear Resistance of Micro-pits Texture on Turning Surface

Qianqian Cai,Yiquan Li, Umair Ayub, Zhanjiang Yu, Jinkai Xu , Huadong Yu

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

- Cutting tools with surface micro-textures can effectively improve the wear resistance of the tool and improve cutting conditions.
- The micro-pit diameter was 35μm, 30μm, 25μm ,20μm and untexture tool on the wear resistance of tool was evaluated.
- Micro-pit texture plays an active role in the friction contact state between blade and chip, adhesion resistance, wear resistance, resistance reduction, storage chip and so on.



25μm micro-pits

Notes

18-5 9:20–9:40

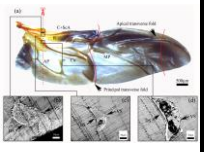
Microstructural Characteristics and Nanomechanical Properties of Hindwings of the Asian Ladybeetle, Harmonia Axyridis

Jiyu Sun[1], Chao Liu[1], Wei Wu[1], Ruijuan Du[1], Zhijun Zhang[2]*

[1] Key Laboratory of Bionic Engineering (Ministry of Education, China), Jilin University

[2] School of Mechanical Science and Engineering, Jilin University Changchun, P.R. China

- At the root of the Asian ladybeetle hindwings, three thicker veins spread out.
- The thickness of the three veins of dorsal side (DS) and ventral side (VS) are different.
- All the E_r and H of DS and VS appear a tendency of linear increasing.
- The results will be useful to the design of new deployable MAV and bioinspired systems.



a)The hindwings of Harmonia axyridis in unfolded state; b) c) d) are LSCM pictures.

Notes

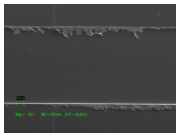
18-6 9:40–10:00

Study on Roughness and Residual Stress of Precision Micro-milling of High Strength Materials

Jinkai Xu and Jingjing Liu and Zhichao Wang and Huadong Yu

Changchun University of Science and Techology College of Mechanical and Electric Engineering Chang Chun,China

- Making micro-groove on aluminum alloy 7075 and stainless steel 0Cr18Ni9 by micro-milling respectively.
- The range analysis method is uesd to obtain the ideal combination of cutting process parameters.
- The results show the surface quality of the 7075 aluminum alloy is better .
- The results has a certain reference value for improving the surface quality of micro-machined high-strength metal materials.



The surface morphology of micro-groove for 7075 aluminum alloy

Notes

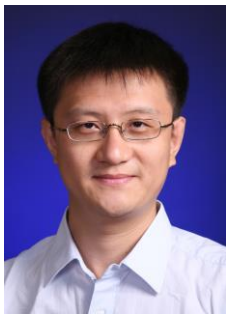
Technical Special Session 19
Design, Analysis and Control of Nano-manipulating Systems (ss)

Banyan Room

10:20–12:20 Thursday, 10 August

Organizer: Zhen Zhang

Co-Organizer: Peng Yan

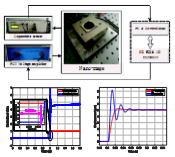


19-1 10:20–10:40

H∞ Control for Piezo-Actuated Nanopositioning Stages with Time Delays

Zhiming Zhang and Peng Yan
School of Mechanical Engineering, Shandong University, China

- The infinite dimensionality of the time-delay systems was considered for nanopositioning control.
- A model of a nanopositioning stage with time delay was constructed by Padé expansion.
- A H∞ controller for a nanopositioning stage was proposed considering the time delay.
- A positioning resolution of 5.54 nm was achieved with good robustness and nonlinearity compensation capability.



Nanopositioning system and experimental results.

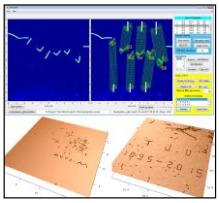
Notes

19-2 10:40–11:00

Automated Manipulation of Flexible Nanowires with an Atomic Force Microscope

Sen Wu, Huitian Bai, and Fan Jin
State Key Lab of Precision Measurement Technology and Instruments,
School of Precision Instrument and Opto-electronics Engineering,
Tianjin University, P. R. China

- New technology is presented to realize highly automated manipulation of flexible nanowires with common AFMs
- Digital image processing techniques are applied to detect nanowires from AFM images
- Parallel pushing vectors are generated and sequentially executed to translate and rotate individual nanowires
- Graph theory is introduced to determine the movement order of multiple nanowires for patterns assembly



Patterns of nanowires assembled by using the auto-manipulation program.

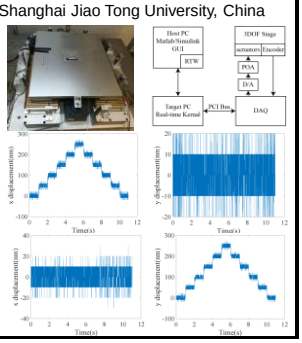
Notes

19-3 11:00–11:20

Design and Driving of a 3-DOF Electromagnetic Direct-Drive Nanopositioning Stage with Long Stroke

Xixian Mo and Bo Zhang
School of Mechanical Engineering, Shanghai Jiao Tong University, China

- a novel electromagnetic driving nano-scale positioning stage with 3 DOF
- +-50nm position resolution over a travel range of 50x50 mm in the xy plane
- the hardware-in-loop simulation scheme is adopted to build the control system of the stage
- describe the dynamic model and design a controller with force distributions



Notes

Technical Special Session 19
Design, Analysis and Control of Nano-manipulating Systems (ss)

Banyan Room

10:20–12:20 Thursday, 10 August

Organizer: Zhen Zhang

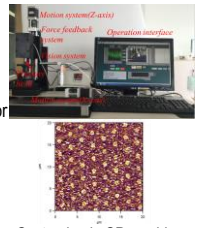
Co-Organizer: Peng Yan

19-4 11:20–11:40

Development of Micro- contact Transfer Printing Platform for Its Expandable Applications in Printed Electronics

Yongqiang Deng and Jin Jiang
Department of Electrical and Computer Engineering, Western University, Canada
Yu Liu, Er-wei Shang, Junhua zhao and Yanqiu Chen
School of Mechnical Engineering, Jiangnan University, China
Peng Yan
School of Mechnical Engineering, Shandong University, China

- Automated high-precision micro-contact transfer printing machine with integrated cantilever sensor force feedback
- Low – cost real-time vision and P motion control for accurate loading to offer ink transfer.
- High resolution contact transfer printing of micro / nano features



Customized μCP machine.

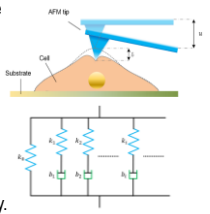
Notes

19-5 11:40–12:00

The Effect of Loading Rate on the Measurement of Cellular Viscoelasticity Properties with AFM

Bo Wang, Wenxue Wang,Yuechao Wang,Bin Liu,and Lianqing Liu
State Key Laboratory of Robotics, Shenyang Institute of Automation, China

- We discussed the effect of the loading rate on the measurement of cellular viscoelasticity properties with AFM.
- The stress-relaxation curves of cells won't be effected by the loading rate of AFM when the loading rate is higher than a threshold.
- The stress-relaxation curves with the loading rate which is higher than the threshold can be used to extract viscoelasticity parameters more accurately.



AFM indentation experiment and general Maxwell model

Notes

19-6 12:00–12:20

Detecting the Micro/nano Physical Properties of Single Lymphoma Cells with Atomic Force Microscopy

Bin Liu*, Fanan Wei, Mi Li, Bo Wang, Lianqing Liu
State Key Laboratory of Robotics, Shenyang Institute of Automation, China
Fanan Wei
School of Mechanical Engineering and Automation, Fuzhou University, China

Non-Hodgkin's lymphoma (NHL) is the most common adult hematological cancer. With the advent of combination therapy of chemotherapy and the monoclonal anti-CD20 antibody Rituximab, the substantial advancement in the treatment of B-cell malignancies has been achieved. In the clinical treatment of NHL, however, there are still many patients who are not sensitive to the therapy of rituximab. Hence investigating the interactions between rituximab and lymphoma cells is crucial for us to understand the actions of rituximab and design drugs with better efficacies. Traditional biochemical methods for cell detection require the various pretreatments of the cell, destroying the structures of cells. This paper uses atomic force microscopy (AFM) to label-free characterize the micro/nano physical properties of single lymphoma cells, including cell morphology, cell elasticity, and molecular interactions on the cell surface. The study improved our understanding of the rituximab actions .

Notes

Technical Session 20

MEMS and Their Applications

Maple Room

10:20-12:20 Thursday, 10 August

Chair: Guoying Gu, Co-Chair: Shuai Guo

20-1 10:20–10:40

Nonlinear Control for a MEMS Hard-Magnetic Micromirror by Using Backstepping Sliding Mode Method

Yanxia Zou* ,Weijie Sun**,and John T. W. Yeow***
College of Automation Science and Engineering,
South China University of Technology, China
John T. W. Yeow
Systems Design Engineering,
University of Waterloo, Waterloo, Canada

- The integration of MEMS offers many new possibilities in the field of optical communication, optical display,adaptive optics and optics switching.
- There are many kinds of torsional micromirrors according to actuation method, such as electrostatic, electromagnetic,electrothermal and piezoelectric.
  Magnetic actuation has become much more and more popular due to its advantages of high scanfrequency, small volume, light weight and low energy consumption.
- The object of this work is to introduce the backstepping sliding mode control to an MEMS hard--magnetic micromirror and conduct the experimental validation on a platform based on FPGA.

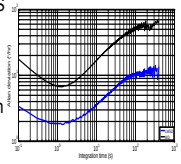
Notes

20-2 10:40–11:00

Design and Test of MEMS Gyroscope Control System Based on LMSD

Shuai Guo, Xudong Zheng*, Yiyu Lin, Wei Ma, Zhonghe Jin
Micro-Satellite Research Center, Zhejiang University
Hangzhou 310027, P. R. China

- This paper proves the feasibility and effectiveness of LMSD algorithm in the digital control system of MEMS gyroscopes.
- The gyroscope using LMSD exhibits a bias stability (BS) of 1.8°/h better than BS 6.7°/h using MD.
- The gyroscope using LMSD exhibits an angle random walk (ARW) of 0.031°/√h better than the ARW 0.114°/√h using MD.
- LMSD has better noise suppression performance than MD in MEMS gyroscopes control system.



Allan deviation results of MEMS gyroscope with LMSD and MD

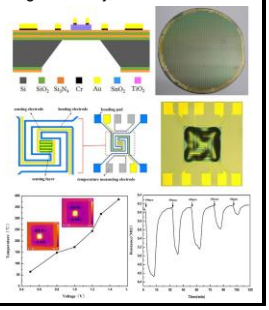
Notes

20-3 11:00–11:20

The Micro Hydrogen Sensor Chip With Low Power Consumption

Hairong Wang, Mengya Wang, Xiaowei Chen, Baoqing Han
State Key Laboratory for Manufacturing Systems Engineering Mechanical Engineering School,Xi'an Jiaotong University,China

- The integrated sensor chip (2x2 mm^2) can detect H_2 (100-900ppm) with low power consumption (36mW).
- Forty hundred sensors chips can be obtained through preparation process from 4 inches wafer.
- The stacked TiO_2/SnO_2 composite materials were used to detect H_2.
- The 1.3μm thick transparent membrane was designed to support the above structure.



Notes

Technical Session 20

MEMS and Their Applications

Maple Room

10:20-12:20 Thursday, 10 August

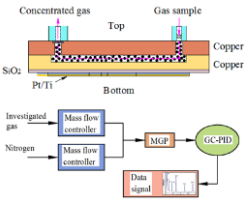
Chair: Guoying Gu, Co-Chair: Shuai Guo

20-4 11:20–11:40

Micro-fabricated Packed Metal Gas Preconcentrator For Low Detection Limit Exhaled VOC Gas Measurements

Baoqing Han, Guishan Wu, Hairong Wang*, Jiuhong Wang
State Key Laboratory for Manufacturing Systems Engineering
Xi'an Jiaotong University, China

- It is used for field detection of the low-concentration exhaled VOC gases
- Improving the gas detection limit of non-invasive medical diagnoses
- Metal substrate with good thermal and mechanical properties, and is easy fabrication
- The target is achieving higher precon-centration factor



Metal gas preconcentrator structure and measurement system

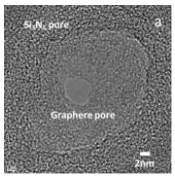
Notes

20-5 11:40–12:00

Double Layer Nanopore Fabricated by FIB and TEM

Haojie Yang and Yunfei Chen
Mechanical Engineering, Southeastern University, China

- We demonstrated that a silicon nitride membrane integrated with a graphene membrane is able to be fabricated.
- The TEM is used to mill the graphene membrane form a 4nm diameter graphene nanopore.
- The two nanopores with different diameter and material are fabricated with the distance of 75 nm.
- This method provides a useful tool to nanopore-based DNA sequence.



Double layer nanopore in TEM

Notes

20-6 12:00–12:20

Photothermal Behavior of Methylammonium Lead-Trihalide Perovskites

Changxin Chen*, Fangfang Wang
Department of Micro/Nano Electronics, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, China
* Email: chen.c.x@sjtu.edu.cn

- The heat generated by photon absorbing in $CH_3NH_3PbI_{3-x}Cl_x$ is 20% less than that in $CH_3NH_3PbI_3$;
- The photothermal and PL data demonstrate that the addition of chlorine into $CH_3NH_3PbI_3$ can efficiently suppress the energy loss by emitting heat or by emitting light;
- These results may be explained from a new sight why the addition of chlorine can improve the battery efficiency.

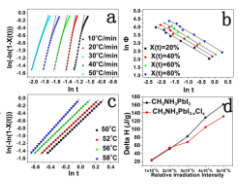


Figure Photothermal behaviors of $CH_3NH_3PbI_3$ and $CH_3NH_3PbI_{3-x}Cl_x$

Notes

Technical Session 20

MEMS and Their Applications

Maple Room

10:20-12:20 Thursday, 10 August

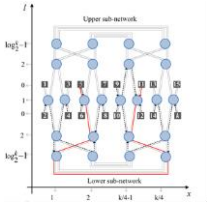
Chair: Guoying Gu, Co-Chair: Shuai Guo

20-7 Poster 1

Worst-Case OSNR in Fat-Tree-Based Optical Networks-on-Chip Employing WDM

Jingping Zhang
The School of Electronic and Information Engineering, Southwest University, China
Yiyuan Xie
The School of Electronic and Information Engineering, Southwest University, China

- Exploiting worst-case OSNR for fat-tree-based ONoCs with WDM
- Analyzing simultaneously the linear crosstalk noise and the nonlinear FWM crosstalk noise
- Studying the influence of crosstalk noise on performance of fat-tree-based ONoCs with WDM



Fat-tree-based ONoC with WDM in worst case

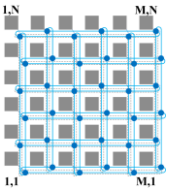
Notes

20-8 Poster 2

Crosstalk Noise and Performance Analysis of WDM-based Torus Networks-on-Chip

Shujian Wang
The School of Electronic and Information Engineering, Southwest University, Chongqing，China
Yiyuan Xie
The School of Electronic and Information Engineering, Southwest University, Chongqing，China

- WDM technology is applied in Torus ONoCs.
- Nonlinear FWM noise is considered in our paper.
- Worst-cast crosstalk noise and network performance are measured in both calculation and simulation.
- A communication system is established by Optisystem to evaluate transmission quality.



Torus optical network

Notes

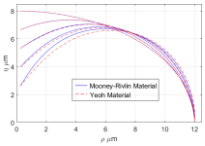
Technical Session 21
Nanohandling Robots and Systems
Pine Room
10:20-12:20 Thursday, 10 August
Chair: Kostadinov K., Co-Chair: Jinyun Liu

21-1 10:20–10:40

A Hyperelastic Model for Mechanical Responses of Adherent Cells in Microinjection

Tianyao Shen*, Bijan Shirinzadeh* and Julian Smith
Department of Mechanical and Aerospace Engineering*&Department of Surgery
Monash University, Australia
Yongmin Zhong
Mechanical School of Engineering, RMIT, Australia

- A general geometrical description of adherent cells in microinjection
- Detailed mechanical responses obtained via minimal potential energy principle
- Discussions on the factors effecting deformed shape, interaction force, stress distribution of the cell membrane
- Comparison to the classical Hertz contact models



Deformation curves

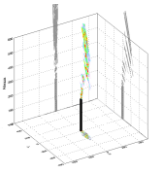
Notes

21-2 10:40–11:00

A Smart LIDAR Based on Compact Nd:YAG Laser for Atmospheric Fine Particulate Matter

Ivan Kostadinov, Francesco Suriano
PROAMBIENTE c/o CNR, via P. Gobetti, 101 – 40129, Bologna, Italy
Hristo Iliev
Binovation Ltd., 20A Inzh. Georgi Belov str., Sofia, 1712, Bulgaria
Dimitar Draganov, Ivan Bachvarov
Phys. Depart. Sofia University, 5 J. Bourchier Blvd., BG-1164 Sofia, Bulgaria

- Implementing of an innovative Nd:YAG operating at 1064 nm, 532 nm and 355 nm.
- Probing of spatial distribution of atmospheric fine particulate matter with 1.875m resolution.
- Monitoring of pollutants emitted by mobile (ships, aircrafts) or stationary sources (industrial plants).
- The compact design allows for its implementation aboard mobile stations for environmental control of urban and industrial areas.


3D reconstruction of a power plant stack plume

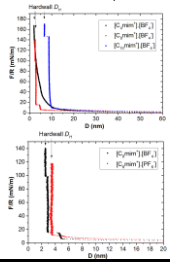
Notes

21-3 11:00–11:20

Surface Force Apparatus Studies on the Surface Interaction of [Cnmim+][BF4-] and [Cnmim+][PF6-] Ionic Liquids

Zhicheng Liu, Peng Zhang, Yongkang Wang, Yajing Kan, Yunfei Chen
School of Mechanical Engineering and Jiangsu Key Laboratory for Design and Manufacture of Micro-Nano Biomedical Instruments, Southeast University, China

- The force-distance curves of ionic liquids with different length of carbochain
- The influence on double layer structure caused by different kinds of anions
- Discussion about the length of Debye and the fits of curves measured by SFA



Notes

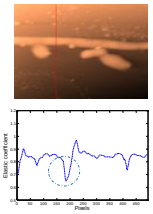
Technical Session 21
Nanohandling Robots and Systems
Pine Room
10:20-12:20 Thursday, 10 August
Chair: Kostadinov K., Co-Chair: Jinyun Liu

21-4 11:20–11:40

A Varying Set-point AFM Scanning Method for Simultaneous Measurement of Sample Topography and Elasticity

Xiaozhe Yuan and Yongchun Fang
Institute of Robotics and Automatics Information System, Nankai University, China

- Analysing the AFM imaging process of soft sample with elasticity.
- Utilizing the varying set-point scanning to change the interaction force between probe and sample.
- Combing the topography data and deflection data to estimate the sample elasticity.
- A novel method to estimate the sample elasticity distribution for contact mode AFM is proposed.



Sample and it's elasticity distribution

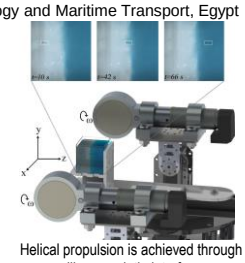
Notes

21-5 11:40–12:00

Experimental Characterization of Helical Propulsion in Newtonian and Viscoelastic Mediums

Dalia Mahdy*†, Abdallah Mohamed*, Anke Klingner*, Ashraf Tammam‡, Abdelmoneim Wahdan‡, Mohamed Serry†, and Islam S. M. Khalil*
*The German University in Cairo, †The American University in Cairo, Egypt
‡Arab Academy for Science and Technology and Maritime Transport, Egypt

- Open-loop control of helical robots is achieved using a permanent magnet-based robotic system to actuate the robot in a reservoir containing silicone oil and gelatin.
- We find that the speed of the helical robot is enhanced with the increasing viscosity of the medium due to the shear-thinning process.



Helical propulsion is achieved through silicone-gelatin interface

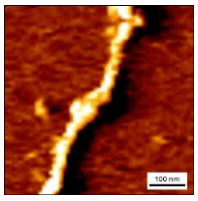
Notes

21-6 12:00–12:20

Imaging of DNA Molecules by Atomic Force Microscope

Fenfen Guo, Feifei Wang, Ying Wang, Wenxiao Zhang, Xinyue Wang, Lu Zhao, Zhengxun Song, and Zuobin Wang
CNM, Changchun University of Science and Technology, China

- 3-Aminopropyl Triethyl Silane (APTES), Ni^{2+} and Mg^{2+} were used to modify the surface of mica substrate
- DNA molecules were adhered to the mica surface through the physical interaction of charges
- The DNA molecules were imaged using an AFM under both air conditions and liquid conditions



AFM image of DNA molecules with the Mg^{2+} modified mica surface in the air

Notes

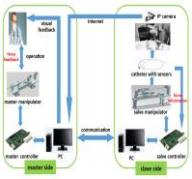
Technical Session 21
Nanohandling Robots and Systems
Pine Room
10:20-12:20 Thursday, 10 August
Chair: Kostadinov K., Co-Chair: Jinyun Liu

21-7 Poster 2

Design and Performance of a Vascular Interventional Surgery Robot

Xu Ma, Xu Zhang and Miao Liu
Tianjin Key Laboratory for Control Theory& Applications in Complicated System, The School of Electrical and Electronics Engineering, Tianjin University of Technology, Tianjin, China

- Interventional surgery (VIS) is the main method for diagnosis and treatment of endovascular diseases. However, the surgeon operates the surgery with hands in conventional VIS, which need the surgeons exposed to X-ray radiation with long time. The operation of the Vascular Interventional Surgery is long time processing, which will lead to fatigue of the doctor and the patient, and the doctor's attention will be reduced.



The System map as a whole concept

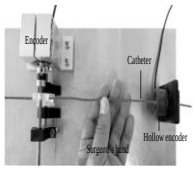
Notes

21-8 Poster 2

Design a Robotic Manipulation System Using the Real Catheter for Remote Catheter Operation

Xu Ma, Xu Zhang and Miao Liu
Tianjin Key Laboratory for Control Theory& Applications in Complicated System, The School of Electrical and Electronics Engineering, Tianjin University of Technology, Tianjin, China

- Vascular Interventional surgery (VIS) is the main method for diagnosis and treatment of endovascular diseases. However, the surgeon operates the surgery with hands in conventional VIS, which need the surgeons exposed to X-ray radiation with long time.



The surgeon console

Notes

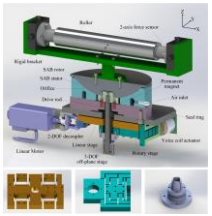
Technical Session 22
Nanopositioning and Nanomanipulation
Cypress Room
10:20-12:20 Thursday, 10 August
Chair: Hui Tang, Co-Chair: Mostafa Alaa

22-1 10:20–10:40

A Roller Support Stage with Remote Center of Motion for Roll-to-Roll Printed Electronics

Shasha Chen, Weihai Chen, Jingmeng Liu
School of Automation Science and
Electrical Engineering, Beihang University, China
Wenjie Chen
Mechatronics Group, Singapore Institute of Manufacturing Technology, Singapore

- A roller support stage with remote center of motion (RCM) is proposed to eliminate the uneven tension for roll-to-roll printed electronics manufacturing machine.
- Classical beam theory and pseudo-rigid-body-model (PRBM) are used to model the designed flexure-based linear stage, rotary stage, and 3-DOF off-plane stage.
- Finite element analysis (FEA) is carried out to validate the established model.



Mechanical structure of the roller support stage

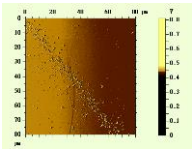
Notes

22-2 10:40–11:00

Manipulation of Magnetic Nanoparticles By Optically Induced Dielectrophoresis

Ying Wang, Feifei Wang, Tingting Huang, Fenfen Guo, Ying Xie, Jinyun Liu, Zhengxun Song and Zuobin Wang
CNM & JR3CN, Changchun University of Science and Technology, China
Zuobin Wang
JR3CN & IRAC, University of Bedfordshire, United Kingdom

- Optically induced dielectrophoresis (ODEP) device can realize the transportation and convergence of micro/nanoparticles
- Magnetic nanoparticles with the diameter of 10-100nm were converged by ODEP
- ODEP has important applications in the manipulation of micro/nanoparticles and objects.



Magnetic nanoparticles manipulated by ODEP

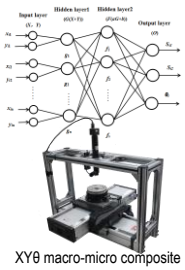
Notes

22-3 11:00–11:20

Sub-Pixel Vision-based Inspection and Control of a Flexure Micropositioner

Sifeng He, Hui Tang, et.al
Key Laboratory of Precision Microelectronic Manufacturing Technology and Equipment of Ministry of Education, Guangdong University of Technology, China.

- A novel 3-DOF macro/micro complex motion system with sub-pixel visual detection algorithm is presented in this paper.
- A novel HRELM-based intelligent sub-pixel inspection algorithm with high-efficiency and high accuracy is proposed and employed as the position sensing method.
- It runs high efficiently (100 times higher than traditional ANN), while providing comparable inspection accuracy with that of using traditional displacement sensors.



XYθ macro-micro composite positioning stage

Notes

Technical Session 22
Nanopositioning and Nanomanipulation
Cypress Room
10:20-12:20 Thursday, 10 August
Chair: Hui Tang, Co-Chair: Mostafa Alaa

22-4 11:20–11:40

Control of Particle Size in Energetic Drop-on-demand Inkjet Method

Ruirui Zhang, Luo jun, Hongcheng Lian, Haobo Lian,Lehua Qi*
School of Mechanical Engineering, Northwestern Polytechnical University
Xi'an, China

- Energetic materials with nanoscale particles by integrating the deposition and the nanocrystallization are obtained.
- Reveal the influence of temperature and frequency on the particle size of energetic materials.
- A proprietary uniform energetic micro-droplet printing equipment is employed
- The drop-on-demand inkjet method is simple and controllable for loading explosive.

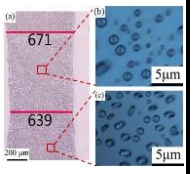


Fig. 1 (a) Optical image of a uniform line of NH4NO3. (b, c) Enlarged view of NH4NO3 granules at different locations

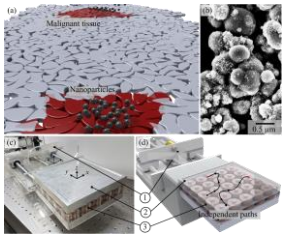
Notes

22-5 11:40–12:00

Independent Control of Nanoparticle Clusters

Mostafa Alaa, Anke Klingner,
Nabila Hamdi, Slim Abdennadher, and Islam S. M. Khalil
The German University in Cairo, Egypt

- Closed-loop motion control of multiple clusters of iron-oxide nanoparticles is achieved using an electromagnetic system.
- The control system is designed based on round-robin scheduling paradigm and enables positioning of multiple clusters towards different reference positions within 2D space.



An electromagnetic system controls multiple clusters of nanoparticles

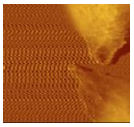
Notes

22-6 12:00–12:20

Controlled Manipulation of TRAIL into Single Human Colon Cancer Cells Using Atomic Force Microscope

Yingmin Qu, Jiuyun Liu, Guoliang Wang, Zhengxun Song and Zuobin Wang
CNM & JR3CN, Changchun University of Science and Technology, China
Zuobin Wang
JR3CN & IRAC, University of Bedfordshire, United Kingdom

- The recombinant plasmids encoded with the enhanced green fluorescent protein (EGFP) were constructed
- SW480 cells were penetrated and transfected by AFM tip
- The expression of recombinant plasmids in SW480 cells was observed by inverted fluorescence microscope



AFM image of SW480 cells

Notes

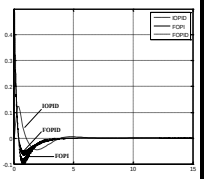
Technical Session 22
Nanopositioning and Nanomanipulation
Cypress Room
10:20-12:20 Thursday, 10 August
Chair: Hui Tang, Co-Chair: Mostafa Alaa

22-7 Poster 1

Design and Simulation of Fractional Order PID Controller for An Inverted Pendulum System

Shuhua Jiang, Mingqiu Li and Chunyang Wang
School of Electronics and Information Engineering, Changchun University of Science and Technology, Changchun

- The paper proposed the design scheme of the inverted pendulum system for a fractional order FOPID-based controller.
- The paper built the transfer function of the displacement of the car and pendulum's angle .
- The FOPID-based controller can achieve better control effect with small overshoot and fast.



Pendulum angle response curve comparison chart

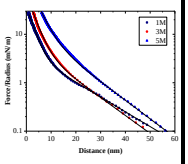
Notes

22-8 Poster 2

Force Measurements between Mica Surfaces in Concentrated Electrolyte Solutions

Peng Zhang, Zhicheng Liu, Yongkang Wang, Yajing Kan, Yunfei Chen
School of Mechanical Engineering and Jiangsu Key Laboratory for Design and Manufacture of Micro-Nano Biomedical Instruments
Southeeast University, P. R. China

- In 0.1 M NaCl solution, long-range force is consistent with DLVO force.
- In 0.1 M NaCl solution, short-range force can be explained by introducing a hydration force.
- In the more concentrated solutions, measured results indicate that an extra diffuse layer is formed.
- The results of this paper are of great significance to study the solid-liquid interface of high concentration electrolyte.



Notes

Technical Session 23
Nanomaterials and Nanoassembly

Aspen Room

10:20-12:20 Thursday, 10 August

Chair: S. M. El-Sheikh, Co-Chair: Somayeh Soleimani-Amiri

23-1 10:20–10:40

Characterization of Novel $C_{10}N_5M_5$ Nanocages (N = B, Al, Ga, and M = N, P, As) at Density Functional Theory

Somayeh Soleimani-Amiri[A] and Maryam Koohi[B]

[A]Department of Chemistry, Karaj branch, Islamic Azad University, Karaj, Iran
solesomy@yahoo.com, s.soleimani@kiau.ac.ir

[B]Young Researchers and Elites Club,North Tehran Branch, Islamic Azad University, Tehran, Iran, mkouhi110@gmail.com

- The geometry, stability and electronic properties of C10N5M5 heterofullerenes are compared and contrasted at DFT (Figure 1).

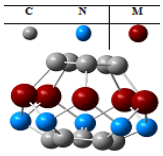


Figure 1. Full geometry optimizations of C10N5M5.

Notes

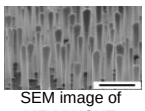
23-2 10:40–11:00

Intentionally Encapsulated Metal Alloys within Vertically Aligned Multi-Walled Carbon Nanotube Array via Chemical Vapor Deposition Technique

Yasuhiko Hayashi[1,2*], H Inoue[1], T. Hayashi[1], T. Tokunaga[3], M. Hada[1,2], T. Nishikawa[1], G. A. J. Amaratunga[4,5]

[1]Okayama Univ., [2]Tokyo Tech., [3]Nagoya Univ., [4]Univ. Cambridge, [5]SLINTEC

- Pd_xCo_{1-x} within vertically aligned multi-walled carbon nanotubes (ME-MWCNTs) through in-situ filling technique during CVD
- Hysteresis loop of the ME-MWCNTs measured by vibrating sample magnetometer shows clear ferromagnetic behavior
- Electron holography in the TEM performed to obtain the saturation magnetization of each Pd_xCo_{1-x} particle in the MAE-MWCNTs and the magnetic interaction between MAE-MWCNTs



SEM image of ME-MWCNTs

Notes

23-3 11:00–11:20

Effect of Deposition Temperature and Heat Treatment on Properties of AZO Nanolamination Films

Jun Guan
College of Science, Changchun University of Science and Technology, China
Qingduo Duanmu*
College of Science, Changchun University of Science and Technology, China

- Bullet points：

1.preparation of AZO nanolamination films by ALD technology

2.effect of substrate temperature and annealing temperature on the structure and properties of thin films

3.AZO nanolaminated film had a suitable temperature window

4.proper annealing can help the structure of the film optimizing

- the preparation of AZO nanolaminated films provides a new material choice for the MCP dynode conductive layer.

Notes

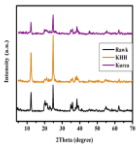
Technical Session 23
Nanomaterials and Nanoassembly
Aspen Room
10:20-12:20 Thursday, 10 August
Chair: S. M. El-Sheikh, Co-Chair: Somayeh Soleimani-Amiri

23-4 11:20–11:40

A Novel Nanokaolinite Photocatalyst for Degradation of P-nitrophenol

S. M. El-Sheikh*a, Ahmed Shawky*a, Sabrin M. Abdob, Mohamed Nageeb Rashada Thanaa I. El-Dosoqyb,
[a]Nanomaterials and Nanotechnology Department, Advanced Materials Division, Central Metallurgical R&D Institute (CMRDI) P.O. Box 87 Helwan, Cairo 11421, Egypt
[b]Chemistry Department, Faculty of Science, Aswan University, Aswan 81528, Egypt
selsheikh2001@gmail.com, phyashawky@gmail.com

- Synthesis of novel nanokaolinite photocatalyst .From bulk kaolinite using simple method.
- The photocatalytic activity of prepared nanokaolinite samples was estimated by degradation of PNP.
- The nanokaolinite (K/urea) showed higher photocatalytic activity compared to raw k.
- The high activity of (k/urea) is related to High surface area, low band gap and N-doping.



XRD patterns of as-prepared nanokaolinite.

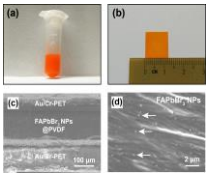
Notes

23-5 11:40–12:00

High Output Piezoelectric Composite Nanogenerators Compose of $FAPbBr_3$ NPs@PVDF

Bing Han, Ran Ding, Xiaohui Ning, Jin Yan, Chenchen Xie
CNM, Changchun University of Science and Technology, China

- Organic–inorganic lead halide perovskite materials have piezoelectric properties
- The nanogenerator shows a maximum piezoelectric output voltage and current density of 30 V and 6.2 μAcm^{-2}
- The organic–inorganic metal halide perovskite-based devices have potential applications in electronic devices, and hybrid energy harvesters



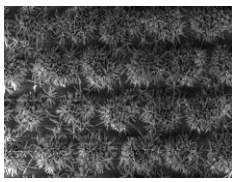
The cross-sectional SEM image of the nanogenerator

23-6 12:00–12:20

Fabrication of TiO_2 Nanowire Arrays Using Laser Interference Lithography Aided Hydrothermal Method

Xiaohui Ning, Qingling Meng, Li Li, Yonglu Han, Dongyang Zhou, Liang Cao, Zhankun Weng, Ran Ding, Zuobin Wang
CNM, Changchun University of Science and Technology, China

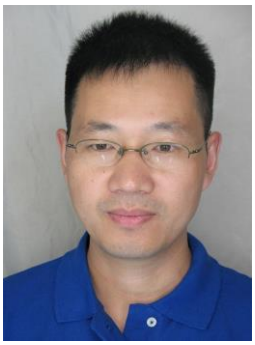
- Laser interference lithography was used in a a hydrothermal process
- FTO conductive glass with one- and two-dimensional grating structures obtained by laser interference lithography
- Highly ordered TiO_2 nanowire arrays can be fabricated on the patterned FTO glass surfaces



2D grating patterned TiO_2 clusters

Notes

Technical Special Session 24
Nanopore Technology (ss)
Bamboo Room
10:20-12:20 Thursday, 10 August
Organizer: Deqiang Wang
Co-Chair: Daming Zhou



24-1 10:20–10:40

Growth of Single Crystal WS_2 Thin Films via Atmospheric Pressure CVD

Biao Zhou , Chengzhi Su
Changchun University of Science and Technology
Biao Shi, Yunjiao Wang, Leyong Yu,
Shuanglong Feng,Deqiang Wang
Chongqing Institute of Green and Intelligent Technology

- The presentation about the parameters of synthesis of single-layer WS2 film.
- The effect of sulfur position and carrier gas flow rate to synthesize WS2 film.
- The explaination of growth mechanism by characterizing granular, massive and monolayer WS_2 crystals.

The contribution is to write this paper and do experiment.

Notes

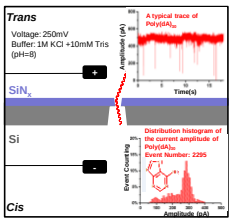
24-2 10:40–11:00

DNA Translocation through Solid-state Nanopore

Xiaojing Zhao, Yue Zhao, Yunsheng Deng, Daming Zhou, Ziyin Zhang, Qimeng Huang*, Deqiang Wang*

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences, Chongqing, China, 400714

- In this work, a 2nm conical nanopore was fabricated by current-stimulus dielectric breakdown on a 20nm thick free-standing SiN_x membrane.
- The fabricated SiN_x nanopore can discriminate 4 types of DNA nucleotides ($poly(dA)_{30}$, $poly(dT)_{30}$, $poly(dC)_{30}$ and $poly(dG)_{30}$).
- Future work should focus on the velocity control for DNA translocation behavior and the selectivity improvement for the nano channel.



A diagram illustration for the experiment set up, showing the translocation of a nucleotide through this conical nanopore.

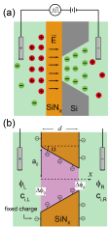
Notes

24-3 11:00–11:20

Rectication of Ion Current Determined by the Nanopore Geometry: Experiments and Modeling

Daming Zhou and Deqiang Wang
Chongqing Institute of Green and Intelligent Technologies, China

- Nanopore in a SiN membrane is fabricated by dielectric breakdown method in the electrolyte;
- The current rectification effect through the pore can be modeled by the Poisson-Nernst-Planck equations;
- The pore shape depends on the polarity of the inducing pulse current;



Nanopore fabrication and the ion transportations in the asymmetric pore

Notes

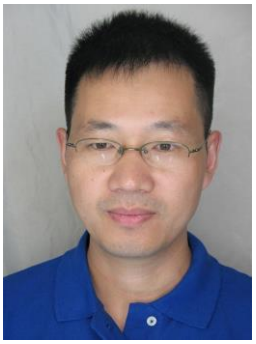
Technical Special Session 24
Nanopore Technology (ss)

Bamboo Room

10:20-12:20 Thursday, 10 August

Organizer: Deqiang Wang

Co-Chair: Daming Zhou



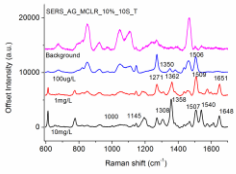
24-4 11:20–11:40

Trace Microcystin-LR Can be Directly Detected with Surface-enhanced Raman Scattering?

Shixuan He, Shaoxi Fang, Wanyi Xie, and Deqiang Wang

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

- Self-Assembly AgNP and SERS-AG substrate are used for detecting the trace microcystin-LR.
- The enhanced performance and characteristic information of trace microcystin-LR are discussed with corrected SER spectra.
- The limit of detection for microcystin_LR can low down to 100ug/L with SERS-AG directly.



The characteristic SER spectra of microcystin_LR

Notes

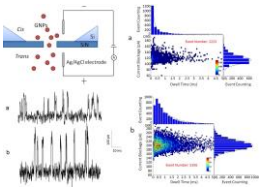
24-5 11:40–12:00

Detection of Gold Nanoparticles Based on Solid-state Nanopore

Feng He[1, 2], Bohua Yin[2], Wanyi Xie[2], Leyong Yu[2], ShouFeng Tong[1]*, Liyuan Liang[2]*, Deqiang Wang[2]*

[1]College of Opto-Electronic Engineering, CUST, China
[2]Chongqing Key Laboratory of Multi-scale Manufacturing Technology, CIGIT, Chinese Academy of Sciences. China

- In this work, a 18 nm conical SiN nanopore was fabricated by dielectric breakdown.
- low salt solution with surfactant was applied to prevent negatively charged gold nanoparticles from aggregation
- The translocation distribution of 10 nm and 15 nm AuNPs can be differentiated through SiN nanopore



The traces and events came from AuNPs translocation through a 18 nm SiN nanopore

Notes

General Information

Shanghai, a fascinating city

Shanghai is one of the four direct-controlled municipalities of China, with a population of more than 24 million as of 2014. Located in the Yangtze River Delta in East China, Shanghai sits on the south edge of the mouth of the Yangtze in the middle portion of the Chinese coast.

Climate

Shanghai has a humid subtropical climate and experiences four distinct seasons. Winters are chilly and damp, with northwesterly winds from Siberia can cause nighttime temperatures to drop below freezing, although most years there are only one or two days of snowfall. Summers are hot and humid, with an average of 8.7 days exceeding 35 ℃ (95 ℉) annually; occasional downpours or freak thunderstorms can be expected.

Architecture

Shanghai has a rich collection of buildings and structures of various architectural styles. The Bund, located by the bank of the Huangpu River, contains a rich collection of early 20th-century architecture, ranging in style from neoclassical HSBC Building to the art deco Sassoon House. A number of areas in the former foreign concessions are also well-preserved, the most notable ones being the French Concession. Shanghai has one of the world's largest number of Art Deco buildings as a result of the construction boom during the 1920s and 1930s. One of the most famous architects working in Shanghai was László Hudec, a Hungarian-Slovak architect who lived in the city between 1918 and 1947. Some of his most notable Art Deco buildings include the Park Hotel and the Grand Theater. Other prominent architects who contributed to the Art Deco style are Parker & Palmer, who designed the Peace Hotel, Metropole Hotel, and the Broadway Mansions, and Austrian architect GH Gonda who designed the Capital Theatre.

Culture

Shanghai is sometimes considered a center of innovation and progress in China. It was in Shanghai, for example, that the first motor car was driven and (technically) the first train tracks and modern sewers were laid. It was also the intellectual battleground between socialist writers who concentrated on critical realism, which was pioneered by Lu Xun, Mao Dun, Nien Cheng and the famous French novel by Andr é Malraux, Man's Fate, and the more "bourgeois", more romantic and aesthetically inclined writers, such as Shi Zhecun, Shao Xunmei, Ye Lingfeng, and Eileen Chang.

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Conference Venue

All sessions will be held at The Longemont Hotel Shanghai

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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

Shanghai's Local Area Code: 021

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