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Day	Time	Paper Title or Activity	Authors	Session	Room
Monday, August 5, 2013	09:00-12:00	**Robotics and Automation for Applications at Nanoscale*** MoTA1.1	Sergej Fatikow	Tutorial 1: Robotics and Automation for Applications at Nanoscale, Sergej Fatikow , University of Oldenburg, Germany − MoTA1	Jade I
		No abstract found			
	09:00-12:00	**Nanoimprint Lithography and Applications*** MoTA2.1	Stephen Chou	Tutorial 2: Nanoimprint Lithography and Applications, Stephen Y. Chou, Princeton University, USA − MoTA2	Jade II
		No abstract found			
	09:00-12:00	**Semiconductor nanowire array based electronic and photovoltaic devices: formation, performance, and scalability*** MoTA3.1	Xiuling Li	Tutorial 3: Semiconductor Nanowire Array Based Electronic and Photovoltaic Devices: Formation, Performance, and Scalability, Xiuling Li, University of Illinois, Urbana, USA − MoTA3	Jade III
		No abstract found			
	13:30-16:00	**Swimming Nano-machines/robots*** MoTB1.1	Li Zhang	Tutorial 4: Swimming Nano-Machines/robots, Li Zhang, the Chinese University of Hong Kong, China − MoTB1	Jade I
		No abstract found			
	13:30-16:00	**Self-rolled-up Micro and nanotubes for Photonics and Passive Electronics*** MoTB3.1	Xiuling Li	Tutorial 6: Self-Rolled-Up Micro and Nanotubes for Photonics and Passive Electronics, Xiuling Li, University of Illinois, Urbana, USA − MoTB3	Jade III
		No abstract found			
				Invited Session: 2D Atomic Crystal Materials −	

Tuesday, August 6, 2013	13:00-13:30	**Graphene and Two-Dimensional Layered Materials for Device Applications** TuAS1.1	Anupama Kaul	TuAS1	Garden Wing Ballroom
		Abstract− Carbon-based nanostructures have been the center of intense research and development for more than two decades now. Of these materials, graphene, a two-dimensional (2D) layered material system, has had a significant impact on science and technology in recent years after it was experimentally isolated in single layers in 2004. The recent emergence of other classes of two-dimensional (2D) layered systems beyond graphene has added yet more exciting and new dimensions for research and exploration given the diverse properties of these beyond graphene 2D systems. For example, hexagonal-BN a layered material closest in structure to graphene, is an insulator, while NbSe, a transition metal dichalcogenide, is metallic and monolayers of other transition metal di-chalcogenides such as MoS2 are direct band-gap semiconductors. The rich spectrum of properties that 2D layered material systems offer can potentially be engineered on-demand, and creates exciting prospects for using such systems in applications ranging from electronics, sensing, photonics, energy harvesting and flexible electronics in the coming years.			
	13:00-13:18	**Silver Nanowires Transparent Conductive Films: Fabrication Using Different Sintering Techniques** TuAS2.1	Jinting Jiu, Tohru Sugahara, Masaya Nogi, Shijo Nagao, Katsuaki Suganuma	Invited Session: Nanopackaging − TuAS2	Jade I
		Abstract− Abstract— Large-scale synthesis of silver nanowires (AgNWs) is achieved by an improved facile polyol method, with the diameter about 70 nm and the length exceeding 20 □m. The synthesized AgNWs can be processed to form a highly transparent thin film, making nanowire networks to realize high electrical conductivity. Simple oven heating and fast light sintering methods have been examined for curing the films, and achieved high transparency and excellent conductivity in both the cases. The obtained conductive transparent films of AgNW are expected to have a wide variety of applications such as solar cells, flat displays, and touch panel sensors in future.			
	13:00-13:15	**Scanning Tunneling Microscopy and Spectroscopy Studies of Self Assembled Sub 10 Nm Copper-Silicide Nanostructures on Si(110)** TuA5.1	Poh Keong Ng, Brandon Fisher, Carmen Lilley	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− Self assembled Cu3Si nanoislands and nanowires on Si(110) were fabricated with electron beam evaporation in ultra high vacuum while annealing the substrate at 600 degC. Scanning tunneling microscopy technique was used to study the resultant nanostructures of sub 10 nm size. Surface images of the nanoisland and nanowire were obtained. The former showed evidence of single crystalline structures. The length, width, and height dimensions of the nanoisland and nanowire were ~ 100 nm × 30 nm × 6 nm and 75 nm × 12.5 nm × 3 nm, respectively. Scanning tunneling spectroscopy on both the nanostructures performed to obtain their local density of states. Both nanostructures did not exhibit metallic behavior.			
	13:00-13:15	**Thin-Film IR Absorbers with High Absorbance and Easy Preparation and Integration** TuA3.1	Y.F. Shang, Xiongying Ye, Z.F. Wang, J.Y. Feng, F. Tang, X.H. Wang	Nanosensors and Actuators I − TuA3	Jade II
		Abstract− Thin-film infrared radiation absorbers are widely used in thermal detectors, and high IR absorption in a wide spectral range is critical to improve the sensitivities of the detectors. In this work, three types of thin-film IR absorbers were prepared and the absorption characteristics were tested. 1 um thick Styrene Butadiene Styrene block polymer (SBS) decorated multiwall carbon nanotubes (MWNTs) films, prepared via solution coating, indicate an average absorbance of 92% in the spectral range of 8~14 um. 1.5 um thick nanostructured Cr thin-films, obtained by sputtering at a high incident angle of 110°, reveal an absorbance of 55% at 8 um which decreases linearly to 35% at 14 um. 4 um thick carbonized photoresist thin-films, formed by ion beam etching, imply an absorbance of 83% at 8 um which declines monotonously to 57% at 14 um. All the thin-film IR absorbers are easy to fabricate and integrate into thermal detectors without need of specific equipment. The SBS decorated MWNT thin-films show the highest IR absorbance and the best uniformity of spectral response in 8~14 um, indicating that they are most suitable to be used as an IR absorber in IR detectors.			
	13:00-13:15	**Incorporating 2D Quantum Effects into Full Band Monte Carlo Simulations of QWFETs** TuA4.1	Fabio Marino, Brian Tierney, Richard Akis, Marco Saraniti, Stephen Goodnick	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors − TuA4	Jade III
		Abstract− A method for incorporating 2D quantum mechanical effects into full-band Cellular Monte Carlo simulator is described and applied to the simulation of Quantum Well Field Effect Transistors (QWFETs). Incorporating all relevant scattering mechanisms, good agreement is obtained between simulation and experiment in the case of a device with an InGaAs channel. The effect of scaling the QW width is also investigated.			

	13:00-13:15	**Self-Assembly of Capillary Network Inside Artificial Hollow Tissue** TuA6.1	Hirotaka Tajima, Masahiro Nakajima, Toshio Fukuda	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− The technique to construct the artificial organ made of cultured cells is required in many fields such as tissue engineering and drug development. However, the tissue-like construction more than 200 μm thick has central hypoxia and results in necrosis because of the limitation of diffusion of materials. Then, we will propose a method to form a tissue-like construction including vascular network in itself. Biocompatible artificial vessel was wrapped in cell-sheet cocultivated with HUVEC and NIH3T3. Culture medium perfused into the artificial vessel will be diffused into the whole construction through vascular network of HUVEC. This technique will be increases the viability of the cells in the construction.			
	13:15-13:30	**Evaluation of Thermal Conductivity of Single Carbon Nanotube in Liquid and Air Using Photofabricated Fluorescence Microsensors** TuA3.2	Hisataka Maruyama, Ryo Kariya, Fumihito Arai	Nanosensors and Actuators I − TuA3	Jade II
		Abstract− We proposed measurement of thermal conductivity of a single carbon nanotube (CNT) using fluorescence temperature sensor in liquid and air. The sensor containing fluorescence dye is used for fixation of CNT, local heat by Joule-heating, and measurement of temperature distribution. The CNT is fixed to the sensors during photofabrication. Thermal conductivity of the fixed CNT is evaluated by the temperature difference between the both ends of CNT, heat quantity of input to the CNT. In this paper, we demonstrated fabrication of evaluation system using photolithography and measurement of thermal conductivity of the single CNT in liquid and air condition. As experimental results, calculated thermal conductivity of the CNT in air (765 ± 45 [W/mK]) is higher than that of the CNT in water (489 ± 60 [W/mK]).			
	13:15-13:30	**Controllable Nanodomain Defects in Ferroelectric/ferroelastic Biferroic Thin Films** TuA5.2	Long Ding, Colm Durkan	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− Enhanced piezo-response force microscopy (E-PFM) was used to investigate the evolution of ferroelectric and ferroelastic nanodomains in a polycrystalline thin film of the simple multi-ferroic PbZr0.3Ti0.7O3 (PZT). Reversible switching of both ferroelectric and ferroelastic domains towards particular directions with predominantly (110) domain orientations are observed. We also showed that along with the ferroelectric/ferroelastic domain switch, there are defects that also switch. We proposed the possible mechanical mechanism behind this controllable defect switching in terms of flexoelectricity and defect pinning.			
	13:15-13:30	**On the Operational Features and Performance of a Memristor-Based Cell for a LUT of an FPGA** TuA4.2	Nandha Kumar Thulasiraman, Haider Abbas F. Almurib, Fabrizio Lombardi	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors − TuA4	Jade III
		Abstract− This paper presents the detailed analysis of a memristor-based cell for a Look-Up Table (LUT) of a FPGA. The basic operational properties of this memristor-based cell are considered in depth. It shows that different from previous schemes, the ringing phenomenon of the so-called normalized state parameter does not affect data integrity. An extensive simulation based analysis of the two basic memory operations (READ and WRITE) and the corrective operation (RESTORE) is provided to show its substantial advantages. Moreover, the impact of varying different features of the memristor (range and dimension) and the feature size of the NMOS is evaluated for the resistive assessment at cell-level to show substantial improvements in terms of energy dissipation and READ/WRITE times.			
	13:15-13:30	**Synthesis and Fluorescent Properties of CdSe Quantum Dots for the Detection of Single Cells Array** TuA6.2	Dahai Ren, Yiqiu Xia, Zheng You	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− As novel quantum fluorescent materials, QDs have longer term photo-stability, narrower emission range, stronger intensity, and broader UV excitation spectra than that of normal fluorescent materials. Due to quantum dots' (QD) quantum scale effect, QDs of different sizes can emit fluorescence of different colors with the same excitation light, making them suitable bio-probes in multiplexed detection, by which we can achieve multiplexed analysis of cells' behaviors in real time. In this paper, we first synthesized CdSe QDs in ODE and TOPO system. To enlarge the fluorescent range and get more fluorescent colors, we utilized paraffin liquid as the solvent instead of QDE and oleic acid (OA) as the stabilizer instead of TOPO. Finally, we obtained CdSe QDs emitting colors varying from purple to red in a simple and green experimental condition, reaching the requirement of multiplexed detection. By this method, we synthesized high-quality QD probes for multi-analysis which is low cost, less contaminating and less dependent on equipments.			

	13:18-13:36	**Nano Enabled 3D Integration of On-Chip ESD Protection for ICs** TuAS2.2	Albert Wang, Zitao Shi, Li Wang, Yuhua Cheng	Invited Session: Nanopackaging − TuAS2	Jade I
		Abstract− This paper reviews recent advances in 3D on-chip electrostatic discharge (ESD) protection design for integrated circuits (IC). Traditional ESD protection structures rely on in-Si PN-junction-based structures, which have inherent disadvantages including fixed ESD triggering and parasitic effects. New ESD protection mechanisms and structures, including nano crystal dots and nano crossbar concepts, provide alternative non-traditional ESD protection solutions enabling post-Si field programmable and above-IC ESD protection designs. These new ESD protection concepts represent a paradigm change in ESD protection designs and are potential solutions to next-generation nano circuits and systems.			
	13:30-13:48	**Wafer-Scale Graphene Synthesis, Transfer and FETs** TuAS1.2	Kenneth Teo	Invited Session: 2D Atomic Crystal Materials − TuAS1	Garden Wing Ballroom
		Abstract− Growth and characterization of graphene grown using copper foils as well as copper films on silicon dioxide on silicon substrates were performed. Kinetics of growth and effective activation energy for the graphene synthesis will be discussed for the surface catalytic synthesis of graphene. Conditions for large-scale synthesis of monolayer graphene will be addressed in this talk. Wafer-scale graphene transfer and electrical results will be presented. Based on our preliminary results from capped 100mm wafer scale graphene transistors, we expect a mobility of 4-6 k cm2/Vs with symmetry hole/electron transport. Key considerations and challenges for scaling are discussed and results for graphene growth on the 300mm wafer scale will be discussed.			
	13:30-13:45	**Single-Electron Tunneling Based Turnstiles: Modeling and Applications** TuA4.3	Ran Xiao, Chunhong Chen	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors − TuA4	Jade III
		Abstract− This paper presents a compact analytical model for single-electron tunneling (SET) based turnstiles. This model can accurately describe the process of tunneling events involved. The device characteristics produced by the model are verified by Monte-Carlo simulation with good agreement. Hybrid SET/MOS circuit co-simulations are successfully performed in Spectre simulator by implementing the proposed model with Verilog-A modeling language. Extensive simulation results show the advantages of realizing some application circuits using SET-based turnstiles.			
	13:30-13:45	**A Novel Shape Information Based Spindle Positioning Method Combining the Polarized Light** TuA6.3	Wang Zheng, Chen Guodong, Huang Haibo, Gao Ping, Wang Zhenhua, Dong Sun, Sun Lining	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− Spindle positioning is the key stage in cell operation. It is very difficult to percept the spindle information from the traditional image. However, the spindle information can be oberserved in the polarized light image easyly. Existing spindle positioning methods may not be effective for solving the problem when the spindle is polluted by noises and background clutter. In order to oberserve the spindle infortion clearly, a novel spindle positioning method is proposed in this paper. Firstly, the cell wall is detected by the shape information from the original image, and then the spindle region is segmentated from the polarized light image inside the cell wall, by using the shape information of the spindle, the exact position of the spindle is got. Experimental results show this method can perform well in real-time, the results analyze also shows the high precision.			
	13:30-13:45	**Electrochemical Properties of Graphene Coated Copper Probes*** TuA3.3	Yonhua Tzeng	Nanosensors and Actuators I − TuA3	Jade II
		No abstract found			
	13:30-13:45	**Local Control of ZnO Nanorods Growing on Au Surface with Three-electrode Microstructure** TuA5.3	Xianli Zong, Rong Zhu	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− Local control of ZnO nanorods growing was realized through applying different external electric-fields on three-electrode microstructure with top coplanar cathode and anode in pair and a bottom gate. The site-selective growth of ZnO nanorods consists of DC method and AC method. In DC control method, under proper DC voltages applied on three electrodes respectively, ZnO nanorods only grow on the cathode. In AC control method, when an AC electric field at megahertz is applied on top two electrodes (cathode and anode) while a DC voltage is applied onto the bottom electrode (gate), ZnO nanorods will grow on and between the opposite ends of the			

		cathode and anode electrode-pair which corresponds with the simulation results of electric field.			
	13:36-13:54	**Electromigration Aware Design for Nano-Packaging** TuAS2.3	Chris Bailey	Invited Session: Nanopackaging – TuAS2	Jade I
		Abstract– Computer simulation of electromigration (EM) in microelectronics devices has been reviewed and a multi-physics simulation method has been proposed and developed so that the electric current, temperature, stress can be solved simultaneously and the vacancy concentration can be predicted in a seamless framework. The model has been used to analyze the current interconnection design of electronic devices in the issue of EM. Some proposed optimizing methods are discussed in this work and shunt structure for solder joint is proposed and been verified to have a significant potential to resist EM by our model.			
	13:45-14:00	**Memristor Crossbar Memory for Hybrid Ultra Low Power Hearing Aid Speech Processor** TuA4.4	Jinal Shah, Pinaki Mazumder, Mahmood Barangi	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors – TuA4	Jade III
		Abstract– Memristive memories are known for their high data density, small read/write delay, and relatively lower power dissipation. This makes them a good fit for biomedical devices. Here, we demonstrate a 2 kb memristive crossbar memory and interface it with an ultra-low power sub-threshold Finite Impulse Response (FIR) filter bank for hearing aid applications. The memory operates optimally at 0.8V supply level and is turned off while not in use. The filter system operates in sub-threshold to maximize power savings. The entire system operates at 0.96MHz clock frequency and consumes 744pJ per FIR operation.			
	13:45-14:00	**Biological Synthesis of Nanomaterials Using Plant Leaf Extracts** TuA5.4	Beom Soo Kim	Nanomaterials: Characterization and Applications I – TuA5	Diamond II
		Abstract– Several plant leaf extracts (Pine, Persimmon, Ginkgo, Magnolia, Platanus, Cherry, etc.) were used and compared for their extracellular synthesis of nanomaterials. Stable gold, silver, copper, and platinum nanoparticles were formed by treating aqueous solution of HAuCl4, AgNO3, CuSO4•5H2O, and H2PtCl6·6H2O, respectively, with the plant leaf extracts as reducing agent. Graphene oxide, which was prepared by oxidation of natural graphite powders, was also reduced using plant leaf extracts. The reduced materials were characterized by elemental analysis, UV-vis spectroscopy, FT-IR, Raman spectroscopy, X-ray diffraction, transmission electron microscopy, thermo-gravimetric analysis, etc.			
	13:45-14:00	**Study the Gas Sensing Mechanism of Oxygen Atom on Pd Doped ZnO (0001)** TuA3.4	Xiao Deng, Jie Hu, Shengbo Sang, Pengwei Li, Gang Li, Wendong Zhang	Nanosensors and Actuators I – TuA3	Jade II
		Abstract– In this paper, we investigate various surface structures of oxygen adsorption on Pd doping Zn-terminated ZnO (0001) by DFT. The results show that oxygen atom prefers to be adsorbed on the H sites of Pd substituting Zn atom of first Zn-O bilayers. The calculated PDOS indicates that a stronger interaction between adsorbed O2p and Pd4d orbitals has been happened at near the Fermi level. Finally, the bonding situation between adsorbed oxygen and surface is analyzed by atomic populations. The study reveals working mechanism of Pd-ZnO gas sensor, which is useful for finding the relationship between doping and sensitivity of sensor in experiment and theory.			
	13:45-14:00	**Quantitative Structure-Activity-Relationships for Cellular Uptake of Nanoparticles** TuA6.4	Rong Liu, Robert Rallo, Yoram Cohen	Nano-Bio-Medicine – TuA6	Diamond III
		Abstract– Quantitative Structure-Activity-Relationships (QSARs) were investigated for cellular uptake of nanoparticles (NPs) using a dataset comprised of 109 NPs of the same iron oxide core but with different surface-modifying organic molecules. QSARs were built using both linear and non-linear model building methods along with a forward descriptor selection from an initial pool of 184 chemical descriptors calculated for the NP surface-modifying organic molecules. The resulting QSAR was a robust Relevance Vector Machine (RVM) model built with nine descriptors, which demonstrated prediction accuracy as quantified by a 5-fold cross-validated squared correlation coefficient ($R2_{CV}$) of 0.77. The William's plot for the RVM based QSAR shows that the nine selected descriptors spanned a reasonable applicability domain. The developed QSAR can provide useful insight regarding parameters that affect NP cellular uptake and thus provide guidance for the selection and/or design of NPs for biomedical applications.			
	13:48-14:06	**Nanomanipulation of Graphene Using Atomic Force Microscopy** TuAS1.3	Zhuxin Dong, Uchechukwu C. Wejinya, Alan Albrecht	Invited Session: 2D Atomic Crystal Materials – TuAS1	Garden Wing Ballroom

		Abstract− The numerous electrical and mechanical properties with which graphene possess has paved the way into a new era of research and exploration. With many companies researching synthesization and transportation techniques there is a demand for the research of tailoring techniques for the future mass industrial usage of graphene within electronic devices. As such, we explore the efficiency, speed, and quality of mechanical manipulation by way of Atomic Force Microscopy (AFM). In particular ideal force, speed, and length parameters were determined for cutting monolayer graphene (MO) on a SiO2 substrate. The ideal force value was determined to be 2.5 μN and ideal length around 150 nm long, with resulting speed relationships producing significant evidence to claim that speed is not a factor in the cutting of MO as long as it remains below a certain threshold velocity, hypothesized to be a result of thermal drift of the AFM cantilever in the Z-axis direction. The overall mechanical manipulation of graphene was then confirmed and an electrode tailored using this technique with said parameters.			
	13:54-14:12	**Nano Sized Silver for Electronic Packaging** TuAS2.4	Jan Felba, Tomasz Falat, Andrzej Moscicki	Invited Session: Nanopackaging − TuAS2	Jade I
		Abstract− Production of modern microelectronic devices needs advanced materials and packaging technologies oriented towards the miniaturization and high reliability of the systems. Nano sized silver can be treated as such advanced material and it is used in modern packaging technologies, especially for flexible electronics. The paper presents information about the practical use of silver particles with the size from 4 nanometers in materials for electronic packaging technologies. The special ink containing nanosilver is use for ink-jet printing electrically conductive structures. Such process can be applied for flexible electronics even when structures are printed on temperature sensitive materials. Ink-jet printing may be used for creating the conductive layers of microvias joining both sides of flexible substrates with acceptable level of resistance. Nano sized silver is also used as a component of hybrid filler for electrically and thermally conductive polymer based composites, although the role of nanosilver particles in transport of current or heat in such materials is limited. Nanosilver plays an increasingly important role in joints elements working at high temperatures. The sintering process is done at temperatures significantly below 300 °C and the highest shear strength of joined elements reached several dozens of MPa.			
	14:00-14:15	**A Carbon Nanotube Vibration Gyroscope Based on Field Emission** TuA3.5	Zhan Yang, Masahiro Nakajima, Yajing Shen, Tao Yue, Qiang Huang, Changhai Ru, Sun Lining, Toshio Fukuda	Nanosensors and Actuators I − TuA3	Jade II
		Abstract− A gyroscope based on Coriolis effect and fabricated by Carbon Nanotube (CNT) will be presented. A CNT is vibration at x direction, when there a rotation around z direction, acceleration happens to the y direction. The natural frequency of MWCNT is depending on the inner diameter, outer diameter and length. The CNT was driven by the electrostatic force to its nature frequency. A CNT with a length of 1 □m was used for emitter and an anode with a bias angle is etched by Focused Ion Beam (FIB) which is set to the opposite to the CNT. An electrode is set near the CNT tip, which is employed to pulling the CNT for mechanical resonances by an AC voltage. The CNT with a resonate frequency of 1 MHz and mechanical quality factor Q of ~400 was tested at rotation speed of 20 rad.s. inside FESEM by a rotation stage.			
	14:00-14:15	**Electrospun Polycaprolactone Nano-Fibers Support Growth of Human Mesenchymal Stem Cells** TuA6.5	Andrea Fotticchia, Yang Liu, Emrah Demirci, Cristina Lenardi	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− Electrospun polycaprolactone (PCL) layers with sub-micron fibres arranged in random, semi-aligned and aligned manners were prepared and their anisotropic mechanical property were further characterised at various stretching angle. Proof of principle study was carried out to assess biocompatibility of electrospun layers with human mesenchymal stem cells (hMSCs). Cell adhesion, viability and orientation outcomes showed that aligned PCL nano-fibers can be applied as a template to guide the alignment of hMSCs and could be a promising scaffold for tissue engineering of anisotropic annulus fibrosus in spinal inter-vertebral disc.			
	14:00-14:15	**Electrical Properties of Nanogap-Based Single-Electron Transistors Fabricated by Field-Emission-Induced Electromigration** TuA4.5	Ryutaro Suda, Shunsuke Akimoto, Kohei Morihara, Jun-ichi Shirakashi	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors − TuA4	Jade III
		Abstract− We report a simple and easy method for the control of electrical characteristics of planar-type nanogap-based single-electron transistors (SETs) using field-emission-induced electromigration, which is so-called “activation”. The advantages of this method are as follows:(1) the fabrication of SETs is achieved by only passing a field emission current through a nanogap and (2) the charging energy of SETs can be controlled by the field emission current through a nanogap. When the activation with the preset current of 500 nA was applied to the nanogaps having initial gap separation of 48 nm, current-voltage characteristics of the activated nanogaps displayed the suppression of electrical current at low-bias voltages known as Coulomb blockade at room temperature. In addition, strong Coulomb staircases were clearly obtained, and the quasi-periodic current oscillations were also observed at room temperature. These results indicate that higher charging energy associated with a smaller Ni island structure within the multiple islands causes a bottleneck mechanism in conduction, improving the Coulomb staircase structures. Moreover, we successively performed the			

		activation using the preset current Is of 500 nA to the nanogap w ith initial gap separation of 27 nm. Coulomb blockade voltage w as clearly modulated by the gate voltage periodically at 16 K, resulting in the formation of single island in the SETs fabricated by the activation. These results imply that activation procedure allow s us to simply and easily control electrical characteristics of planar-type nanogap-based SETs.			
	14:00-14:15	**High-Electrical-Resistivity CVD Diamond Films with Tri-Layer UNCD-MCD-UNCD Structures for 3DIC Applications** TuA5.5	Yonhua Tzeng	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− Three-dimensional Integrated-circuit (3DIC) needs coatings w ith both high thermal conductivity and high electrical insulation for isolating electronic devices and interconnects w hile spreading heat generated by stacked integrated circuits effectively. Single crystalline diamond possesses excellent electrical insulation and thermal conductivity, w hich is a perfect candidate for the need by 3DIC. How ever, a large-area coating of single crystalline diamond is difficult to achieve. So w e use polycrystalline diamond films instead. But for polycrystalline diamond films w ith many grain boundaries, the severe phonon scattering and electrically conductive graphitic carbon contents in grain boundaries cause the electrical insulation and the thermal conductivity to decrease. The smaller the grain size is, usually the decrease is more severe. A good compromise is to retain the high thermal conductivity of diamond crystals w hile minimizing the electrical conductivity of polycrystalline diamond coatings by removing the charge-transfer doping mechanism enabled by hydrogen termination on diamond grains and minimizing graphitic carbon in the grain boundaries. This paper reports a large-area tri-layer diamond coating structure to achieve sustainable 1010 Ωcm electrical resistivity in the ambient atmosphere. A nanodiamond base layer provides a high-density diamond seeding layer for the polycrystalline diamond film to contain few voids and graphitic carbon in the grain boundaries. The second nanodiamond film is used to encapsulate the de-hydrogenated microcrystalline diamond film to prevent degradation of electrical resistance due to the ambient atmosphere.			
	14:06-14:24	**Synthetic Micro/nanoengineered Tools to Study Mechanobiology and Its Regulatory Role for Human Pluripotent Stem Cells (hPSCs)** TuAS1.4	Jianping Fu	Invited Session: 2D Atomic Crystal Materials − TuAS1	Garden Wing Ballroom
		Abstract− In this talk, I w ill discuss our recent effort using synthetic micro/nanoengineered tools to study mechano-sensitive and -responsive behaviors of human pluripotent stem cells (hPSCs) and the underlying molecular and cellular mechanisms.			
	14:15-14:30	**Probabilistic Neuromorphic System Using Binary Phase-Change Memory (PCM) Synapses: Detailed Power Consumption Analysis** TuA4.6	Daniele Garbin, Manan Suri, Olivier Bichler, Damien Querlioz, Christian Gamrat, Barbara DeSalvo	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors − TuA4	Jade III
		Abstract− In this paper w e investigate the use of phase-change memory (PCM) devices as binary probabilistic synapses in a neuromorphic computing system for complex visual pattern extraction. Different PCM programming schemes for architectures w ith- or w ithout-selector devices are provided. The functionality of the system is tested through large-scale neural netw ork simulations. The system-level simulations show that such a system can solve a complex real-life video processing problem (vehicle counting) w ith high recognition rate (>94%) and low pow er consumption. The impact of the resistance w indow on the pow er consumption of the system is also studied. Results show that the learning-mode pow er consumption can be dramatically reduced if the RESET state of the PCM devices is tuned to a relatively low resistance. Read-mode pow er consumption, on the other hand, can be minimized by increasing the resistance values for both SET and RESET states of the PCM devices.			
	14:15-14:30	**Synthesis of Tungsten Oxide Nanow ires/porous Silicon Composite and Its Sensing Properties for NO2** TuA3.6	Shuangyun Ma, Mingda Li, Ming Hu, Jiran Liang, Changqing Li	Nanosensors and Actuators I − TuA3	Jade II
		Abstract− A novel composite structure of WO3 nanow ires/ porous silicon has been successfully synthesized via a convenient thermal evaporation method w ithout using any catalysts. The diameters and lengths of nanow ires are 40-60 nm and 20-30 μm, respectively, and the aspect ratio (length/diameter) of nanow ires could be in range of 500-750. The obtained products w ere investigated by scanning electron microscopy, transmission electron microscopy, and energy dispersive spectroscopy. The response to NO2 of WO3 nanow ires/porous silicon composite w as investigated. It w as found that the composite sensor had a good response to NO2 at 50 oC. The low est concentration of NO2 detected w as 1ppm and the response could be up to 6.17 at NO2 concentration of 6 ppm. The novel composite structure improved sensing properties w hich are significant for future applications.			

	14:15-14:30	**Multi-Layered Liposome Containing Nanosensor for Transfecting into a Cell Nucleus** TuA6.6	Taisuke Masuda, Hisataka Maruyama, Ayae Honda, Fumihito Arai	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− In this paper, we developed transfection of a single fluorescent nanosensor into a cell nucleus using step-wise fusion of liposome for cellular temperature measurement. The single fluorescent temperature nanosensor is included in the multi lamellar liposomes using Layer-by-Layer formation. The sensor is manipulated by optical tweezers and transfected into the cell or cell nucleus by membrane fusion. To achieve this, a nanotechnology was developed that creates a multi lamellar liposome, which we refer to as Layer-by-Layer absorbed lipid membrane (LBL Lipsome). We also evaluated measurement size and surface charge of multi-layered liposome by the method of resistive pulse sensing. We demonstrated the fabrication of the liposome containing single sensor, immobilization of the sensor to cellular membrane, and transfection of the sensor into the cell cytoplasm and nucleus.			
	14:15-14:30	**Synthesis of CuO Nanowires from Porous Copper with Promising Application for Nanoenergetic Materials** TuA5.6	Daguo Xu, Ting Huang, Qiaobao Zhang, Xiang Zhou, Mohsen Torabi, Kaili Zhang	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− Large-area CuO nanowires have been synthesized by thermal oxidation of porous copper film in static air. The effect of the thermal oxidation temperature and duration are found to influence the growth of CuO nanowires significantly. With an optimized condition, the porous copper film is converted into pure CuO. The application of the as-synthesized CuO nanowires in nanoenergetic materials is also studied. The ignition temperature of the reaction between Al and CuO is significantly lower than those in micro scale or bulk composites.			
	14:24-14:42	**Snowflake-Like Graphene Dendrites on Polycrystalline Copper*** TuAS1.5	Yonhua Tzeng	Invited Session: 2D Atomic Crystal Materials − TuAS1	Garden Wing Ballroom
		Abstract− Graphene is a two-dimensional (2-D) atomic layer of sp2-bonded carbon crystal forming a honey-comb structure with six-fold symmetry. Since graphene was proven stable in the ambient environments with outstanding and unique properties, such as extremely high electron mobility of 1,000,000 cm2/v/s at 4°K and 250,000 cm2/v/s at 300°K, a number of novel processes for the mass production of graphene have been widely investigated for practical applications. Among them, chemical vapor deposition (CVD) is proven promising for achieving high-electronic-quality graphene of large areas while a few hurdles remains to be overcome, including small graphene domain size, which hinders electron mobility in CVD graphene due to adverse effects of electron scattering by lattice imperfections at abundant domain boundaries. Many efforts have been made in pursuit of novel routes to the synthesis of large-domain-size, single-crystalline, and single-layer graphene. Here we demonstrate snow flake-like, single-domain, mono-layer graphene dendrites with high ratios of edge length to the surface area by a topographically controlled growth mechanism using thermal chemical vapor deposition in gas mixtures of methane and hydrogen. A dynamic balance between adsorption of carbon supplied by Cu catalytic dissociation of methane and its loss due to hydrogen etching and high-temperature thermal desorption at edges of graphene results in narrow gaps between branches of graphene dendrites.			
	14:30-14:48	**Carbon nano materials for heat dissipation and 3 D stacking applications*** TuAS2.5	Johan Liu	Invited Session: Nanopackaging − TuAS2	Jade I
		No abstract found			
	14:30-14:45	**Rapid Influenza A Antigen Detection Using Carbon Nanostrings As Label for Lateral Flow Immunochromatographic Assay** TuA6.7	Natpapas Wiriyachaiporn, Hathainan Sirikett, Tararaj Dharakul	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− In this study, we investigated a feasibility of using carbon nanostrings as reporters in developing a lateral flow immunochromatographic system for a rapid influenza A antigen detection as a model. Carbon nanostrings were successfully conjugated to monoclonal antibody specific to the nucleoprotein, one of the most abundant influenza A protein, for a signal visualization. To demonstrate the feasibility of the lateral flow immunochromatographic system using carbon nanostrings as reporters for influenza A antigen detection, the system was applied to detect the antigen in an allantoic fluid infected with pandemic 2009 influenza A H1N1 virus. It was shown that the system was able to detect the influenza A nucleoprotein in a complex biological fluid such as an infected allantoic fluid containing 2.8×103 TCID50/mL (50% tissue culture infectious dose). By using carbon nanostrings as reporters combined with lateral flow immunoassay as the mean of antigen detection, a specific recognition of influenza A antigen could be achieved within 15 min. Compared to the existing methods of influenza A diagnosis such as viral isolation and serological approaches, this simple one-step			

		immunochromatographic system avoids laborious and multiple incubation steps, as well as maintaining a sensitive and specific detection which could be useful for developing a point-of-care diagnostic test in other applications.			
	14:30-14:45	**Mechanical Properties of Alumina Composites Reinforced with Hybrid Fillers** TuA5.7	Jian Liuq, Kyle Jiang	Nanomaterials: Characterization and Applications I – TuA5	Diamond II
		Abstract– Alumina (Al2O3) ceramic composites reinforced with hybrid fillers comprising of graphene platelets (GPLs) and silicon carbide (SiC) nanoparticles were prepared using Spark Plasma Sintering. The effect of SiC nanoparticles on the mechanical properties of the ceramic composites was investigated. It is found the SiC is efficient in refining the ceramic matrix. The introduction of 1, 3 and 5 % SiC together with 1.33 vol% GPL results in fine microstructures with average grain size of 2.18, 1.16 and 0.82µm. Toughening effect of GPLs which serves role as crack bridging, pull-out and crack deflection in the composites is enhanced in these fine microstructures since more contact areas between GPLs and ceramic matrix are formed. Mechanical properties of the Al2O3 composites are significantly improved with the introduction of the hybrid fillers. A 36.64% increase in hardness as well as a 43% increase in flexural strength and a 47.5% increase for the Al2O3 ceramic composites have been achieved by adding GPLs and SiC.			
	14:30-14:45	**Development System for Memristor Circuits** TuA4.7	Jhon Faghih-Nassiri, Nicholas Maddy, Lucas Buckland, Dmitri Strukov	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors – TuA4	Jade III
		Abstract– This paper reports on an experimental system comprising of an embedded 32-bit ARM microprocessor with ADC/DAC peripherals and supporting software designed for memristor circuit development. In particular, the system is tested with Pt/TiO2-x/Pt memristors, and read and write operations with single memristive devices are demonstrated.			
	14:30-14:45	**Micro-Mechanical Device-Based in Situ Nanomechanics Studies of 1-D Nanomaterials*** TuA3.7	Yang Lu, J. Lou	Nanosensors and Actuators I – TuA3	Jade II
		Abstract– By design and development of a novel Micro-Mechanical Device (MMD), which enable both scanning electron microscopy and transmission electron microscopy (SEM & TEM) imaging of sample structure evolution as well as real-time measurement of their mechanical properties at unprecedented high resolution, we were able to characterize individual one-dimensional (1-D) nanomaterials with a wide range of diameters, from tens of nanometers to hundreds of nanometers, and made significant progresses toward deeper understanding of their size-dependent mechanical properties and deformation mechanisms. This paper reviews our recent progresses on systematic nanomechanics studies of metallic nanowires (NWs) and carbon nanotubes (CNTs) by using the MMD, with particular emphasis placed on size effect in tensile strength and fracture mechanisms. We found that, for both gold and nickel NWs with diameters ranging from 100-300nm, critical resolved shear stress was found to increase as the NW diameter decreased, showing strong size dependence, However, gold NWs tended to fail in ductile mode while nickel NWs usually failed in a brittle fashion. For CNTs, we found that the effect of nitrogen doping possess markedly different plasticity and loadbearing abilities owing to the differences in their wall structures and associated failure mechanisms. These findings may provide valuable insights for researchers looking at future 1-D nanomaterials-based nanoelectronic devices and nano-electro-mechanical systems (NEMS).			
	14:42-15:00	**Engineering Graphene Sheets for Nanosensors*** TuAS1.6	Li Wen, Haider Al-Mumen, Fubo Rao, Lixin Dong	Invited Session: 2D Atomic Crystal Materials – TuAS1	Garden Wing Ballroom
		Abstract– Graphene, a single free-standing atomic layer of carbon, has opened up whole new research areas in physics, chemistry, material science and nanotechnology in just the past few years. Graphene has many extraordinary properties that make it very attractive as a material for post-silicon electronics. For example, the electron mobility of graphene is more than 140 times higher than silicon and its thermal conductivity is more than 2 times higher than diamond. In addition, the 2-dimensional structure of graphene results in an extremely high surface-area-to-mass ratio, which makes it very efficient to detect absorption/desorption of molecules. Therefore, graphene is considered to be one of the most promising materials in biological/chemical molecule sensing applications. Such applications are largely based on the geometries of graphene sheets. In this presentation, we overview the processes for engineering the graphene sheets that we have recently developed for building gas and biological cell sensors. These include singular sheet etching of graphene with ground-electrode oxygen plasma for layered graphene steppers and an anomalous electron-beam lithography process for template-less fabrication of graphene nanomeshes and multi-ribbons. Gas and biological sensors are developed based on the engineered graphene nanoribbons, layered steppers, and meshes.			

	14:45-15:00	**Micropatterning of Bioactive Ligands for High-Throughput Study Neuronal Network Functions** TuA6.8	Peng Shi	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− Synapses are essential components for signal processing and transmission in the nervous system, whose function is affected in many brain diseases and disorders. We demonstrated the successful control of synapse formation by micropatterning of synaptogenic protein, neuroligin (NL). Interestingly, the presence of a hydrophobic GPI moiety, promoted NL's biological activity. Also, the micropatterns of synaptogenic factors were included in a neurite growth/guidance platform, which could directly be used as a high-throughput platform for study different aspects in the development and dynamics of neuronal network.			
	14:45-15:00	**CNT-Embedded Electro-Microchannel for Cell Electroporation** TuA5.8	Mehdi Shahini, John T.W. Yeow	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− We present a new approach for electroporating cells through a CNT-featured microfluidic device. Micro-devices have become a promising approach for cell manipulation systems. Among cell manipulations techniques, cell electroporation requires relatively higher power to disrupt membrane of cells. This requirement opposes integration of cell electroporation with other on-chip functions to achieve a full-functional point-of-care testing machine. Here we present a new approach for electroporating cells though a microfluidic chip featured by CNT on one electrode. A new methodology for embedding aligned CNT on microchannel has been presented. In the CNT-embeded device, CHO cells are passed through a forest of aligned CNTs so that the enhanced electric field near the tip of CNTs get the cells electroporated. Calcein AM dye has been used as an indication of electroporation. The results show that with an operational voltage as low as 3 V CHO cells are electroporated while the yield rate of electroporation is 72% higher compared to a no-CNT device. This achievement is a considerable progress toward integration of cell electroporation with other low-voltage on-chip mechanisms.			
	14:45-15:00	**Nano-Scale Sensor Networks for Chemical Catalysis** TuA3.8	Eisa Zarepour, Mahbub Hassan, Chun Tung Chou, Adesoji A. Adesina	Nanosensors and Actuators I − TuA3	Jade II
		Abstract− Following the success of conventional macro-scale wireless sensor networks, researchers are now investigating the viability of nano-scale sensor networks (NSNs), which are formed by establishing communication between devices made from nanomaterials. Due to unique properties of nanomaterials, it is envisaged that such NSNs can support completely new types of applications beyond what could be achieved with conventional sensor networks. In this paper, we propose and investigate a novel application of NSNs in the field of chemical catalysis. More specifically, our goal is to explore the use of NSN to improve product selectivity of Fischer-Tropsch (FT) reaction, a major class of chemical reactions for converting natural gas to liquid fuel. Given that nano-scale wireless communication is at very early stages of development, we investigate FT selectivity as a function of communication reliability of the underlying NSN using molecule-level simulations. Our study reveals that packet loss probability (p) of the NSN is an important factor for improving FT selectivity, but the rate of improvement in selectivity is not uniform in the entire range of p. We can quickly increase selectivity up to a certain point by decreasing p, but further improvement in selectivity requires an exponential reduction in p. This finding suggests that although chemical catalysis may benefit from early adoption of NSNs, communication reliability will be a major factor in taking the full-advantage of such nano-networks.			
	14:45-15:00	**An Approach to Constructing Reversible Multi-Qubit Benchmarks with Provably Minimal Implementations** TuA4.8	Jerzy Jegier, Pawel Kerntopf, Marek Szyprowski	Nanoelectronics: Devices - SET, RTD, QD, Molecular, Memristors − TuA4	Jade III
		Abstract− This paper reports on a method of the construction of new difficult benchmarks for reversible logic synthesis. It is shown how to extrapolate 3- and 4-variable reversible functions implemented by gate count minimal circuits having regular structure. In this way sequences of reversible functions of an arbitrary number of variables have been constructed for which we have built minimal circuits implementing them. For two example sequences of functions we applied the synthesis tool Revkit trying different synthesis algorithms. The outcome shows a large gap between the circuits synthesized by the tool and the ones proved minimal by construction.			
	14:48-15:06	**Low-Stress Ultra-Low Dielectric Porous Polymer for High Density Applications: A Review** TuAS2.6	Jones Chong, David Lam	Invited Session: Nanopackaging − TuAS2	Jade I
		Abstract− Two major issues that prevented organic substrates and interposers from achieving high VOs at fine pitch and dimensional stability are thermal expansion mismatches between material layers and requirement of low dielectric constant to improve signal transmission. Thermal dimensional stability is dependent on the difference in thermal expansion between the various materials in the package, the temperature, and the elastic modulus, when stresses are considered. The dielectric constant of a material can be modified on a molecularly level, or by injection of pores into the material. In this study, the development of a new class of low stress coating that has ultra-			

		low dielectric (ultra low-k) constant is reviewed. Using new low temperature vapor induced separation process, pores were injected into polyimide to form a coating that is dense on the surface, but is porous in the core. Thermal mechanical testing showed that the introduction of pores did not affect the glass transition temperature, which indicated that the molecular entanglement and free volume of the polymer in the struts remained unchanged. However, tests showed that the elastic modulus was dramatically lowered, and the dielectric constant was lowered to 1.65. To demonstrate the process compatibility of the new material with conventional circuitization procedure, circuits were built using metallized porous polyimide. Performance test data showed that the material is compatible with wet etching process, and signal speeds in transmission lines built on porous polyimide were significantly faster than lines build on dense polyimide. Combined with its high mechanical compliance, low-stress porous polyimide is an excellent alternative for high speed substrates.			
	15:00-15:15	**Biomimetic Polyelectrolyte Multilayer Ultrathin Films to Promote Osseointegration** TuA5.9	Massimo Giulianelli, Laura Pastorino, Roberta Ferretti, Carmelina Ruggiero	Nanomaterials: Characterization and Applications I − TuA5	Diamond II
		Abstract− The integration between bone and implant plays a key role in several fields, such as maxillofacial, dental and orthopedics. The improvement of the bone/implant interface has been considered with great interest for many years, mostly as relates to titanium-based implants, in which implantation surgery may induce implant infections. Such infections are the main cause of mechanical loosening and incomplete integration of the implant. The bone/implant interface has been mostly improved by physical approaches acting on the surface topography and by chemical and/or biochemical surface modification. The latter approach is focused on the incorporation of organic molecules. The work described here is focused on surface modifications of implants by layer-by-layer (LbL) self-assembly of Collagen I (COL) and Hyaluronic Acid (HA) in order to promote osteogenesis and reduce bacterial infections. This technique allows to coat surfaces of any shape using ultrathin film multilayers oppositely charged polyelectrolytes. The multilayer ultrathin films were initially deposited on a Quartz Chrystal Microbalance surface in order to monitor and optimize fabrication. Subsequently, the multilayer structure has been replicated on Titanium substrates and characterized by SEM and AFM. The coatings have been tested in vitro with 3T3 cells seeded on titanium supports with and without HA/COL structures. The results described here show that structures based on these coatings can improve osteogenesis. The fabrication method is easily reproducible and versatile.			
	15:00-15:15	**Hierarchical Silica Nanomembrane Driven by Thermal Shrinkage and Its Application for Solid Phase DNA Extraction*** TuA6.9	Ye Zhang, Yi Zhang, Tza-Huei Wang	Nano-Bio-Medicine − TuA6	Diamond III
		Abstract− The unique properties of nanomaterials make them attractive for multiple applications, and various techniques to fabricate nanostructures have been developed. In this paper, we describe a novel method to fabricate hierarchical silica nanomembrane based on spontaneous surface wrinkling by making use of heat-shrinkable polyolefin (PO) films deposited with silica. The resulting surface exhibits overlaying hierarchical structures ranging from nano to micro scale, which is mainly determined by the thicknesses of silica deposition. These hierarchical structures significantly enlarge the specific area of silica on the membrane surface, indicating its potential application for solid phase DNA extraction. We have applied our nanomembrane for DNA purification and its efficiency was evaluated by comparing with commercial magnetic particles. Results demonstrate that DNA isolated with nanomembrane has higher recovery yield, purity and better integrity than that with particles. Furthermore, we have successfully applied our nanomembrane to extract DNA from cultured cells with high yield, good purity as well as integrity comparable with that with golden standard phenol chloroform.			
	15:30-16:00	**Long Survival Observation of C. Elegans Inside Environmental SEM for Nanomanipulations** TuB3.1	Masahiro Nakajima, Naoya Nakanishi, Naoki Hisamoto, Masaru Takeuchi, Hirotaka Tajima, Qiang Huang, Michio Homma, Toshio Fukuda	Nanorobotics − TuB3	Jade II
		Abstract− This paper presents a novel technique for long survival observation of Caenorhabditis elegans (C. elegans) inside Environmental-SEM (E-SEM) for nanomanipulations. We have developed the nanorobotic manipulation system inside an Environmental-Scanning Electron Microscope (E-SEM) integrated optical microscope (OM) for nanobiomanipulation platform. Our platform provides a real-time high resolution image under water-contained condition in nano-meter high-magnification image. One of the difficulties on the E-SEM observation is to maintain the biological sample on survival condition in long time. In this paper, we propose a coating method on the C. elegans or sample substrate for maintain the survival condition to keep in wet-condition. The proposed technique is useful to operate the nanomanipulation on C. elegans body, for example nano-injection of functional micro-nano beads as demonstrated in this paper.			
	15:30-15:50	**Nanostructure Design and FIB Fabrication of Plasmonic Lens for Near-Field Nanolithography*** TuBS1.1	Jiaxin Ji, Yonggang Meng	Special Track: Nanomanufacturing in China − TuBS1	Garden Wing Ballroom

		Abstract− The surface plasmons (SPs) generated on a conductor/insulator interface has an attractive feature to focus laser beams on a spot smaller than the diffraction limit near the surface, and thereby could be utilized to form superfocusing plasmonic lens (PL), which could be useful for near-field nanolithography, laser heat assisted magnetic recording and other applications. In this study, three different designs of PL structure, concentric grooves (CG), concentric grooves with a central hole (CGH) and concentric grooves with a central pillar (CGP) are investigated by using numerical simulation method with the software COMSOL Multiphysics, and their characteristics are compared in terms of the full width at half maximum (FWHM) and the field enhancement of the SPs propagation for the radial polarized 355nm laser beams. It is found that a focus spot size (FWHM) of □/3 (□ is the wave length of the laser beam) can be achieved by the conventional CG type, while the CGP and CGH types can result in either much smaller spot size □/8 and higher intensity enhancement, mainly depending on the size of the pillar or hole diameter respectively. Different from the field enhancement effect of traditional optical nanoantennas, the pillar of the CGP type PL has an optimal value of aspect ratio (film thickness/ diameter of pillar) by changing the polarization direction of incident light. When the aspect ratio is equal to 1.8, the field intensity and FWHM obtained the optimal values, and the same result has been shown by using the Finite Difference Time Domain (FDTD) simulation. Focused ion beam (FIB) has been used to fabricate the proposed three types of PL nanostructure with high accuracy. The CGH type PL with a central hole of 64nm in diameter and the CGP type PL with a central pillar of 45nm in diameter have been successfully fabricated.		
	15:30-15:48	**Nanodiamond As a Multimodal Platform for Drug Delivery and Radiosensitization of Tumor Cells** TuBS2.1	Tristan Petit, Hugues Girard, Mathilde Combis-Schlumberger, Romain Grall, Sandrine Morel-altmeyer, Philippe Bergonzo, Sylvie Chevillard, Jean Charles Arnault	Invited Session: Nanoassemblies and Devices − TuBS2	Jade I
		Abstract− Nanodiamonds (NDs) are often considered as inert platforms with high interests for biomedical applications. They are well adapted for drug delivery, and may display embedded fluorescence. We report here on a new way to consider these nanocarbon particles, by revealing therapeutic capacities coming from electronic properties of NDs. With an optimized surface chemistry, the generation of Reactive Oxygen Species (ROS) occurs when those hydrogen-terminated NDs are exposed to photon irradiation, thus opening up the field towards the radiosensitization of tumor cells.			
	15:30-15:45	**Nanohub-U: A Science Gateway Ventures into Structured Online Education** TuB4.1	Victoria Farnsworth, Mark Lundstrom, Supriyo Datta, Ronald Reifenberger, Arvind Raman, Timothy Fisher, Alejandro Strachan, Michael McLennan, Swaroop Shivarajapura, Lynn Zentner, Krishna Madhavan, Gerhard Klimeck	Nanoelectronics: Circuits and Architecture I − TuB4	Jade III
		Abstract− nanoHUB.org is arguably the largest online nanotechnology user facility in the world. From an initial user base of about 1,000 users, nanoHUB has grown to support over 250,000 users annually. nanoHUB supports users in 172 countries with materials for research and education, along with a wide variety of simulation tools covering many nano-related areas. Preliminary assessments of user behavior patterns have shown that nanoHUB's open access approach enables published resources to be integrated directly into classrooms. However, there is an increasing demand for pedagogically sound, workforce-ready, advanced courses that allow users to gain depth in topical areas related to nanotechnology. This paper explores an initial case study where an evolving cyber environment, based on the powerful HUBzero platform, begins to offer structured online courses to its massive audience through an experiment known as nanoHUB-U. This paper describes the impetus for this new offering and discusses how new and cutting-edge content formats are being combined with online simulations in significant ways. Further, it explores in-depth the outcomes related to one of the most popular courses offered to date.			
	15:30-15:45	**Substrate Effect on Single Carbon Nanotube Based Infrared Sensors** TuB5.1	Liangliang Chen, Ning Xi, Ruiguo Yang, Bo Song	Nanophotonics I − TuB5	Diamond II
		Abstract− Infrared (IR) sensors have been widely used for military and civil industry, while carbon nanotube (CNT) research progresses have been made in recent years. This led to investigation and development of CNT based IR detectors. In this paper, CNT-metal based Schottky barrier structure was designed to detect IR irradiance, and different interfacial layer, including SiO2, parylene-C, Si3N4, quartz, and polyimide, was used under CNT-metal contact to isolate substrate noise. The experimental results have shown that, the polymer based interfacial layer has strong substrate noise reduction on CNT IR sensor. The dark current is less than 0.3 nA under the condition of photocurrent 170 nA, noise at 0.5 nA when CNT-metal contact was fabricated on polyimide polymer due to substrate isolation and noise reduction.			
	15:30-15:45	**Doping Fluctuation Induced Performance Variation in SiNW Biosensors** TuB6.1	Xinrong Yang, Pengyuan Zang, William Frensley, Dian Zhou, Walter Hu	Nanobiosensors − TuB6	Diamond III
		Abstract− We analyze the doping fluctuation induced stochastic performance variation in charge based Si nanowire (SiNW) biosensors. We show that for given doping statistics and system topology configuration, electrostatic biasing condition can be tuned to optimize overall sensor sensitivity. Systems that utilize NW arrays may achieve			

		optimal sensitivity at different biasing condition than that for individual NW sensors.			
	15:45-16:00	**Utilizing Two Dimensional Photonic Crystals to Study the Relation between the Air Duty Cycle and the Light Extraction Efficiency of InGaN-Based Light-Emitting Diodes** TuB5.2	Ming-Lun Lee, Cheng-Ju Hsieh, Vincent Su, Yao-Hong You, Po-Hsun Chen, Hung-Chou Lin, Han-Bo Yang, Chieh-Hsiung Kuan	Nanophotonics I – TuB5	Diamond II
		Abstract– In this paper, we have fabricated two-dimensional (2-D) photonic crystals (PhCs) in order to obtain the high light extraction efficiency of InGaN-based Light Emitting Diodes (LEDs) and then we used front-side illuminated micro-photoluminescence (μ-PL) spectroscopy to measure the PL intensity of our InGaN-based LEDs, we also used back-side illuminated inverted microscopy to double check our PL intensity results. From the PL intensity results, not only a nearly threefold increase in the PL intensity was observed, but also that the light output intensity has the air duty cycle dependent characteristic was demonstrated.			
	15:45-16:00	**The Shortest Path Method for Quantum Boolean Circuits Construction** TuB4.2	Chin-Yung Lu, Shiou-An Wang	Nanoelectronics: Circuits and Architecture I – TuB4	Jade III
		Abstract– At present, only the exhaustive synthesis algorithm can find all the optimal quantum Boolean circuits. It is more difficult to synthesize a more complicated quantum Boolean circuit. In this paper, we use the method of circuit bipartition to partition a more complicated quantum Boolean circuit into simpler circuits in order to reduce the difficulty of the more complicated quantum Boolean circuit synthesis. And find these partitioned quantum Boolean circuits by searched the database of quantum Boolean circuits according the method of the shortest path in the circuit. Finally, combine these partitioned circuits to become the more complicated quantum Boolean circuit. This approach can significantly reduce the synthesis complexity of a more complicated quantum Boolean circuit. We can see that the results are very close to the optimal circuits according to the experimental results of all the 3-variable reversible functions.			
	15:45-16:00	**Fabrication and Research of Flexible Arrayed Glucose Biosensor Combined with the Magnetic Beads** TuB6.2	Jyun Wun Lin, Jung-Chuan Chou, Yi-Hung Liao, Tsung-Yi Cheng, Ya Li Tsai, Chiung Yun Jhang, Hsueh-Tao Chou	Nanobiosensors – TuB6	Diamond III
		Abstract– In this study, the ruthenium dioxide (RuO2) sensing films were prepared by radio frequency sputtering system on the flexible polyethylene terephthalate (PET) and used the screen printer technology to prepare the conducting wires to connect the sensing windows and spread on insulation layer by epoxy which can protect the conducting wires and sensing windows. In the experimental, first, the biosensors were analyzed for the pH value of the hysteresis reaction (5.651 mV). Second, the magnetic beads and glucose oxidase (GOD) were combined with covalent binding, and coated on the sensing windows by Nafion. It was used to measure the linearity and sensitivity, as well as analyzed the different volume ratios of Nafion and GOD and the stability of the glucose biosensors. The results showed that the glucose biosensors exhibit a high linearity (0.987), sensitivity (29.652 mV/mM) by the volume ratio of Nafion to GOD is 3:4 and present high stability, which can be measured the glucose solution, repeatedly.			
	15:48-16:06	**Femtosecond laser photodynamic assembling for functional micronanostructures and devices*** TuBS2.2	Bin Bin Xu, Hong Xia, Yong-Lai Zhang, Qi-Dai Chen, Hong-Bo Sun	Invited Session: Nanoassemblies and Devices – TuBS2	Jade I
		No abstract found			
	15:50-16:10	**Nanorobotics with Force Microscopy: Manipulation, Assembly and Characterization*** TuBS1.2	Hui Xie	Special Track: Nanomanufacturing in China – TuBS1	Garden Wing Ballroom
		No abstract found			
	16:00-16:15	**Resistive Random Access Memories with Nanodiamond Dielectric Films** TuB4.3	Yonhua Tzeng	Nanoelectronics: Circuits and Architecture I – TuB4	Jade III
		Abstract– We report the application of nanodiamond prepared by microwave plasma chemical deposition system as the dielectric film with copper as top electrodes and a tungsten counter electrode for the fabrication of resistive random access memory (RRAM). The RRAM is switched between the high-resistivity state and a low-resistivity			

		state of nanodiamond film. The high or low resistance state can be probed by applying a low voltage across two counter electrodes on two sides of the nanodiamond film and measuring its conduction current. We observed that the Cu/Nanodiamond/W structure shows good performance with ON/OFF current ratio >105 and retention time >104 s. Nanodiamond is known to be chemically inert, good for heat dissipation, and has very low solid solubility in copper. It is, therefore, a suitable dielectric material for RRAM for harsh environments.			
	16:00-16:15	**Enhancing Sensitivity in Colorimetric Immunoassay by Using Secondary Antibody-Gold Nanoparticle Conjugate** TuB6.3	Weerakanya Maneeprakorn, Chayachon Apiwat, Tararaj Dharakul	Nanobiosensors – TuB6	Diamond III
		Abstract– A lateral flow colorimetric immunoassay (LFA) based on gold nanoparticles (AuNP) for detecting the antibody-antigen interaction and gold enhancement for amplifying the specific binding signal has been developed. Influenza A was used as the model study to determine the performance of the system. Nucleoprotein (NP) of the influaza A virus was selected as the targeting molecule. Two different sizes of AuNP conjugated to antibody against NP were prepared and applied to the assay. The 1st conjugate was AuNP immobilized with an anti-NP antibody and secondary-immobilized with biotinylated bovine serum albumin (B-BSA). The 2nd conjugate was AuNP immobilized with an anti-biotin antibody. The detection sensitivity of the enhanced sensitivity LFA increased about 3-folds and 8-folds compared with conventional LFA and commercial influenza A LFA, respectively. The signal intensity of the test spot/line at the capture test zone was increased dramatically. With this method, nucleoprotein of influenza A virus can be detected within 15 minutes and was highly reproducible. The results indicated that the technique can facilitate the more sensitive LFA test for diagnosis of many diseases.			
	16:00-16:15	**Effect of Morphology on the Performance of Organic Solar Cells** TuB5.3	Dan Horia Popescu, Bogdan Popescu, Paolo Lugli, Cristina Varone, Werner Jiang	Nanophotonics I – TuB5	Diamond II
		Abstract– Organic polymer solar cells have attracted increasing attention over the last decade. Substantial efforts have been made in order to improve the performance of these low cost, solution processed photovoltaic devices, resulting in efficiencies as high as 5% compared to merely 1% in the early 2000s. Beside the planar heterojunction – bilayer strucuture- and the bulk heterojunction – a blend of the acceptor and donor polymers – a new concept has recently emerged, namely nanopatterning the donor and/or acceptor materials. Our simulation study aims to investigate the effect of different patterns on the performance of the solar cells. The different simulated structures are then compared with a bulk heterojunction in terms of fill factor, open circuit voltage and short circuit current.			
	16:00-16:15	**Probing Mechanical Behaviors of Chronic Myeloid Leukemia Cells in Doxorubicin Resistance by Robotic Manipulation with Optical Tweezers** TuB3.2	Kaiqun Wang, Jinping Cheng, Qiulin Tan, Dong Sun	Nanorobotics – TuB3	Jade II
		Abstract– Cell mechanics are correlated with cell functions, and are regarded as an effective biomarker indicating onset and progression of diseases. Chronic myeloid leukemia (CML) is defined as a myeloproliferative disorder, expressed as increased proliferation of the granulocytic cells in blood and bone marrow. Chemotherapy drug resistance is a major obstacle to the treatment of CML. However, information associated with the cellular mechanical behavior of CML cells in chemotherapy drug resistance is not well understood. In this paper, the mechanical behaviors of CML cells and their drug-resistant counterparts is probed using optical tweezers technology. Experimental results show that CML drug-resistant cells are stiffer than CML cells. Alteration of mechanical behavior of cells is affected by the actin cytoskeleton. The cell microstructural model is used to model the mechanical response of cells of these two types and further extract the structural parameters of the actin cytoskeleton. These findings verify to some extent that mechanical behavior of cancer cells can be a potential marker for chemotherapy drug sensitivity.			
	16:06-16:24	**Magnetically Actuated Microstructure for Targeted Cell Transportation** TuBS2.3	Sangwon Kim, Famin Qiu, Samhwan Kim, Ali Ghanbari, Cheil Moon, Li Zhang, Bradley J. Nelson, Hongsoo Choi	Invited Session: Nanoassemblies and Devices – TuBS2	Jade I
		Abstract– This paper proposes a method for fabricating three-dimensional (3-D) porous microstructures using a photocurable polymer. The structures were coated with nickel as magnetic material for magnetic manipulation and with titanium as a biocompatible material for in-body use. The fabricated microstructures were controlled using external magnetic fields for remote actuation. Human embryonic kidney 293 (HEK 293) cells were cultured in the microstructures to demonstrate their feasibility for cell transportation. The fabricated microstructures are suitable as targeted cell transportation platforms.			
	16:10-16:30	**Micro/Nano Fabrication and Sensor Technology in XJTU*** TuBS1.3	Yulong Zhao	Special Track: Nanomanufacturing in China – TuBS1	Garden Wing Ballroom

		No abstract found			
	16:15-16:30	**Visual Servoing Methods in Robot-Assist Cell Microinjection System** TuB3.3	Yu Xie, Hai Juan Yang, Kai Liu, Lingyun Wang, Wen ming Xi	Nanorobotics − TuB3	Jade II
		Abstract− Robot-assist microinjection is attracting a lot attention for its potential in providing high throughput and high precision in biological industry. This paper addresses two visual servoing issues in a robot-assist zebrafish embryo microinjection system. The first one is the microscope autofocusing method with the aim of reducing the sophistication of the whole manipulation system. The suitability of different focus criteria are evaluated in the scenario of robotic embryo microinjection system and an optimization technique is proposed to speed up the autofocusing process. The other issue is the implementation of the visual processing algorithm for cell detection and location. Three different segmentation methods for cell detection and location are evaluated in the processing speed and precision.			
	16:15-16:30	**Optimization of Debye Parameters for Dielectric Materials and Investigation of Symmetric SPP Mode Propagation Properties in DMD Waveguide** TuB5.4	Md. Ghulam Saber, Rakibul Hasan Sagor, Asif Al Noor, Md. Thesun Al-Amin	Nanophotonics I − TuB5	Diamond II
		Abstract− The Modified Debye Model (MDM) parameters for Cuprous Oxide (Cu_2O) and Silicon-Germanium Alloy (1.5:1) are presented. A nonlinear optimization algorithm has been developed in order to optimize the parameters for the materials. The obtained parameters have been used to determine the complex relative permittivity, which show an excellent agreement with the experimental values. The root-mean-square (RMS) deviations are found to be as little as 0.1638 and 0.3710 respectively. Finally symmetric Surface Plasmon Polariton (SPP) mode propagation properties in a Dielectric-Metal-Dielectric (DMD) waveguide constructed with silver (Ag) and Cu_2O have been studied both analytically and numerically for further verification of the obtained MDM parameters.			
	16:15-16:30	**Compact Modelling for Co/BTO/LSMO Ferroelectric Tunnel Junction** TuB4.4	Zhaohao Wang, Weisheng Zhao, Anes Bouchenak-Khelladi, Yue Zhang, Weiwei Lin, Jacques-Olivier Klein, Dafiné Ravelosona, Claude Chappert	Nanoelectronics: Circuits and Architecture I − TuB4	Jade III
		Abstract− Ferroelectric Tunnel Junction (FTJ) is able to store non-volatile data in the spontaneous polarization direction of ferroelectric tunnel barrier. Recent progress have demonstrated its great potential to build up the next generation Non-volatile Memory and Logic (NVM and NVL) thanks to the high OFF/ON resistance ratio, fast operation speed, low write power, non-destructive readout and so on. In this paper, we present the first compact model for Co/BTO/LSMO FTJ nanopillar, which was reported experimentally to exhibit excellent NVM performance. This model integrates related physical models of tunnel resistance, static coercive voltage and dynamic switching delay. Its accuracy is shown by the good agreement between numerical model simulation and experimental measurements. This compact model has been developed in Verilog-A language and implemented on Cadence Virtuoso Platform. Simulations validated the static and dynamic behaviors of this model, indicating that it can be efficiently used for the analysis and design of hybrid FTJ/CMOS circuits.			
	16:15-16:30	**The Corresponding Relationship Research between Human Lower Limb Operation Mode and Muscle Information** TuB6.4	Zhang Fengfeng, Yaping Yu, Dong Sun, Sun Lining, Huang Haibo	Nanobiosensors − TuB6	Diamond III
		Abstract− Surface EMG (sEMG) with correlation exists between the active and functional status of the muscle can be a very good reaction to neuromuscular activity. Study concerning this has important significance to the development of research on rehabilitation robot. This paper aims to study the action pattern recognition technology . We can obtain the characteristic value of lower limb EMG signal and pattern recognition with the time and the level of excitement with the muscles corresponding to the lower extremity operation mode . The first step to deal with the collected muscles sEMG is to conduct a denoising pretreatment, and then use the power spectrum method to obtain a characteristic value of each muscle . Finally, make a fuzzy analysis to the obtained features so that we can identify corresponding relationship between the sEMG and the lower extremity operation mode . It was found that the the excitement of the time and the level of excitement are different for each muscle sEMG . sEMGs have similar activity in the same mode, and a clear distinction in the different operating modes . In a different operation mode, conduct a pattern recognition to the characteristic value of the surface EMG , and the operating mode thereof can be discriminated. Keywords: surface EMG, characteristic value ,pattern recognition, power spectrum method, fuzzy analysis			
	16:24-16:42	**Progress on nanomembranes scrolls for**	Yongfeng Mei	Invited Session: Nanoassemblies and Devices −	Jade I

		actuator and sensor* TuBS2.4		TuBS2	
		No abstract found			
	16:30-16:50	**Hybrid Nanogenerator with Micro-Nano Dual Structure*** TuBS1.4	Haixia Zhang	Special Track: Nanomanufacturing in China – TuBS1	Garden Wing Ballroom
		Abstract– Top-Down Micro-Nano Fabrication Technology in IME, Peking University Mass Production of Micro-Nano Dual Structure in different materials Hybrid Nano Generator based onTriboelectric & Piezoelectric mechanism Demonstrations of Applications			
	16:30-16:45	**Ph Sensing Comparison of Vapor and Solution APTES Coated Si Nanograting FETs** TuB6.5	Pengyuan Zang, Yuchen Liang, Lisa Spurgin, Walter Hu	Nanobiosensors – TuB6	Diamond III
		Abstract– We tested and compared the pH sensing with lithographically defined Si NGFETs modified in APTES-ethanol solution and APTES vapor. Both sensors show a good linear response over the pH range of ~ 4 - 9. The vapor APTES coated sensor exhibits higher sensitivity than the solution APTES coated sensor, although the hysteresis is slightly larger.			
	16:30-16:45	**Influence of the Deposition Process on the Bandgap and Electrical Properties of TiO2 Solar Cells** TuB5.5	Saad Al-sabbagh	Nanophotonics I – TuB5	Diamond II
		Abstract– Abstract:. Bandgap variation have been studied as a function to the deposition temperature , annealing temperature and water ratio . High temperature (during deposition or annealing has yielded in a low bandgap, while increasing water concentration has increase it .I-V characteristics for different thicknesses demonstrates a better Voc for a thicker sample. Conversion efficiency at a high temperature gave a better response towards the midrange of the UV spectrum.. High temperature response in these cells can be considered as an advantage over that of conventional solar cells.			
	16:30-16:45	**Multi-Level Cell Spin Transfer Torque MRAM Based on Stochastic Switching** TuB4.5	Yue Zhang, Weisheng Zhao, Jacques-Olivier Klein, Wang Kang, Damien Querlioz, Claude Chappert, Dafiné Ravelosona	Nanoelectronics: Circuits and Architecture I – TuB4	Jade III
		Abstract– Spin Transfer Torque Magnetic Random Access Memory (STT-MRAM) provides a promising pathway forthe next generation of non-volatile memory and logic chips. The perpendicular magnetic anisotropy (PMA) in CoFeB/MgO /CoFeB magnetic tunnel junction (MTJ) nanopillar provides high thermal stability and low critical current. However, the STT switching mechanism of MTJ has been revealed intrinsically stochastic, which results from the unavoidable thermal fluctuations of magnetization. This phenomenon affects deeply the reliability of hybrid CMOS/MTJ interface circuits and drives important power overhead. In this paper, we present a multilevel cell (MLC) STT-MRAM benefiting from the stochastic behaviors. It allows not only higher storage density, but also reduces the programming power and delay. This new cell can be also used as electrical synapse to build up neuromorphic computing systems or other biological networks. Monte-Carlo statistical simulations based on a 40 nm technology node have been carried out to validate its functionality and demonstrate its performance.			
	16:30-16:45	**Kinodynamic Planning and Tracking Control of Biological Cell Formation with Optical Tweezers** TuB3.4	Haoyao Chen, Dong Sun	Nanorobotics – TuB3	Jade II
		Abstract– Biological cell transportation with optical tweezers attracts increasing attention in biomedicine and cell engineering. This paper presents an efficient approach to the transportation of multiple cells into desired formation in complex microenvironments. To prevent from collision with other particles, a sampling-based tree planner is designed to generate a valid trajectory which is tracked by the optically trapped multi-cell formation. In addition, the leader-follower framework is utilized to generate the desired positions and velocities of the cells in formation at each sampling time, and the synchronization control method is used to ensure that the multiple cells maintain the formation constraints during the motion. The dynamics of optically trapped cells is also considered in the controller design. In this way, the cells can be manipulated to form formations efficiently and safely. Simulations of manipulating optical trapped cells in formation are finally performed to verify the effectiveness of the proposed approach.			
	16:42-17:00	**Morph-Genetic Phosphate/Carbon,**	Xinyong Tao	Invited Session: Nanoassemblies and Devices –	Jade I

		Oxide/Carbon, and Carbide/Carbon Nanostructures Derived from Plants* TuBS2.5		TuBS2	
		Abstract− Nature is the greatest laboratory in the world, providing various examples of biological materials with complicated, optimized, and efficient hierarchical morphologies and multiple scales ranging from nano to macro. The material synthesized from biotemplates with hierarchical nanostructures will achieve high porosity and high surface area, which could effectively increase the reaction surface and improve the structure dependent properties such as energy storage, catalysis, photonics and gas sensing. In our recent work, phosphate/carbon, carbide/carbon, and oxide/carbon nanostructures have been prepared via biotemplating methods. Hierarchical LiFePO4/C spirulina microstructures were synthesized using native spirulina as both the carbon source and the template. Owing to its unique hierarchical microstructure, spirulina-templated LiFePO4/C exhibited remarkable electrochemical performance as cathode materials for lithium ion batteries. Cotton and bamboo based carbothermal methods were developed to prepare nanowires of covalent carbides (SiC and B4C) and interstitial carbides (TiC, TaC, NbC, TixNb1-xC, and TaxNb1-xC). The use of natural nanoporous bamboo and cotton as both the renewable carbon source and the template for the formation of catalyst particles greatly simplifies the synthesis process. The obtained carbide hybrid structures exhibited remarkable mechanical properties and energy storage performance. Hierarchical porous NiO/C microspheres have been prepared using porous pollen grains as templates. These NiO/C microspheres exhibited remarkable energy storage performance due to the unique hierarchical porous structures.			
	16:45-17:00	**Room-Temperature Non-Blinking Single Photon Nanoemitters** TuB5.6	Ferruccio Pisanello, Luigi Carbone, Luigi Martiradonna, Godefroy Leménager, Alberto Bramati, Massimo De Vittorio	Nanophotonics I − TuB5	Diamond II
		Abstract− In this work we propose rod-shaped core/shell CdSe/CdS colloidal nanocrystals as efficient non-classical light sources. These nanoemitters show peculiar features such as pronounced photoluminescence stability and high single-photon emission efficiency at room-temperature, making us envision their possible employment as single-photon sources for quantum communications protocols.			
	16:45-17:00	**Detection of Weak Nano-Biosensor Signals Corrupted by Shot Noise** TuB6.6	Wanzhi Qiu	Nanobiosensors − TuB6	Diamond III
		Abstract− Nano-scale biosensors have been identified as the next generation devices for biological and chemical sensing applications and fast sequencing of the human genome. However, detecting targeted molecules is proven to be a challenging task due to weak signal strengths and strong noises. It is therefore vital to understand the noise statistics and develop effective signal detection techniques in order to facilitate the development of reliable devices. In this paper, we build on molecular dynamics simulation results which reveal that the ionic current signals of DNA translocations through solid-state nanopores include both thermal and shot noise, and develop algorithms for effective detection of these signals. Theoretical and simulation results show that the locally most powerful detector has the potential to significantly outperform the classical matched filter.			
	16:45-17:00	**Motion Simulation of an Artificial Flagellum Nanorobot** TuB3.5	Jiansheng Xu	Nanorobotics − TuB3	Jade II
		Abstract− With the development of the mico/nano technology and it overlaps and interacts with other subjects, it will be possible that the nanorobot goes into the blood vessel to diagnose and treatment. It is obviously a very challenging task. Based on my previous research work, and in view of the movement mechanism of flagellum bacteria, I conceive a novel vascular nanorobot which takes artificial flagellum as kinematic mechanism and is driven by the external rotational magnetic field-artificial flagellum nanorobot. The robot consists two parts,and one is the ellipsoid head, and the other is artificial flagellum tail. The tail model is studied according to the resistance force theory, and the robot model is set up by N-S equations. After modeling the robot, I do the motion simulation in MATLAB.And the simulation results show that the proposed model is feasible.			
	16:45-17:00	**Node Detection and Message Integrity through Quantum Circuits** TuB4.6	Tien-Sheng Lin, Ting-Hsu Chang, Chia-Hung Chien, Shiou-An Wang, Sy-Yen Kuo	Nanoelectronics: Circuits and Architecture I − TuB4	Jade III
		Abstract− This paper designs quantum testing circuit to detect intermediate malicious node and achieve message integrity in the distributed quantum computing. The proposed mechanism has several improvements shown as follows. The random key generation between Alice and Bob such that an attack cannot break this deriving process. Local unitary operations and quantum teleportation in the entangled particles can be used to transfer quantum information in a secure way. The intermediate node has no capability to differentiate the difference between superposition state and entanglement state in the transmission qubit. The quantum testing circuit uses this property to detect malicious node and achieve message integrity in the distributed quantum computing. By using circuit, the liar detection probability can be promoted. The proposed			

		circuit is scalable.			
	16:50-17:10	**Electrohydrodynamic Direct-Writing for Large-Area Micro/Nano-Structures*** TuBS1.5	Yong'an Huang	Special Track: Nanomanufacturing in China – TuBS1	Garden Wing Ballroom
		Abstract– Mechano-electrospinning (MES) is able to direct-write a large-area nanofiber-array with a large nozzle in a continuous manner. An MES-assisted surface-tension driven self-organization fabricate large-scale ordered microarrays in tunable manner. Three kinds of micro-structures (straight, serpentine and fractal structures) can be fabricated by MES for flexible electronics.			
	17:00-17:18	**A bottom-up engineered broadband optical nanoabsorber for radiometry and energy harnessing applications** TuBS2.6	Anupama Kaul	Invited Session: Nanoassemblies and Devices – TuBS2	Jade I
		No abstract found			
	17:00-17:15	**Dextrous Stick Coordination Manipulation for 3D Hydrogel Assembly by Dual-Nanomanipulator** TuB3.6	Huaping Wang, Masahiro Nakajima, Tao Yue, Chengzhi Hu, Qiang Huang, Toshio Fukuda, Masaru Takeuchi	Nanorobotics – TuB3	Jade II
		Abstract– A novel dextrous stick coordination manipulation (DeSCom) system with dual-nanomanipulator was proposed for the assembly of three-dimensional (3D) structures. The coordination control between two dextrous sticks was realized based on the vision feedback and the manipulation resolution was around 30 nm. It was set up with hybrid motors to ensure the large operation range and operation precision. The dextrous stick was fabricated with glass pipette and the 2-dimensional (2D) unit was fabricated by UV illumination of the hydrogen named Poly (ethylene glycol) Diacrylate (PEGDA). The immobilization and assembly of 2D unit was achieved through the interaction of two sticks. The DeSCom system could realize the arbitrary 3D structure with the change of 2D unit shape through the different patterning with UV illumination. At last, the bottom-up integration of the 3D structure was performed based on the utilization of DeSCom strategies with image processing information. The preliminary assembly experiment was achieved.			
	17:00-17:15	**ESD Protection Design for Radio-Frequency Integrated Circuits in Nanoscale CMOS Technology** TuB4.7	Chun-Yu Lin	Nanoelectronics: Circuits and Architecture I – TuB4	Jade III
		Abstract– Nanoscale CMOS technologies have been used to implement the radio-frequency integrated circuits. However, the thinner gate oxide in nanoscale CMOS technology seriously degrades the electrostatic discharge (ESD) robustness of IC products. Therefore, on-chip ESD protection designs must be added at all input/output pads in CMOS chip. To minimize the impacts from ESD protection on circuit performances, ESD protection at input/output pads must be carefully designed. In this work, a new proposed ESD protection design has been realized in a nanoscale CMOS process. Experimental results of the test circuits have been successfully verified, including RF performances, I-V characteristics, and ESD robustness.			
	17:00-17:15	**Spoofed Surface Plasmon Polariton (SSPP) Gap Structure for High Sensitivity Bio-Sensing in THz** TuB6.7	Zhao Xu, Kyungjun Song, Pinaki Mazumder	Nanobiosensors – TuB6	Diamond III
		Abstract– We demonstrate enhanced sensitivity to refractive index (n) change in THz sensing by using the spoofed surface plasmon polariton (SSPP) architecture modified with gap blocks. The transmission peak as a function of n is significantly sharpened through the introduction of the additional cavity resonance, and such phenomenon is strongly dependent on the geometric dimensions of the block structure as well as the choice of probe frequencies. Non-invasive THz bio-sensing is a promising alternative to conventional tagging-based sensing schemes. In response to the growing demand for lower detection limit, our SSPP gap structure can effectively reduce the sample usage by enabling localized sample deposition within the gap cavity. The differentiation of DNA molecules with distinct binding states is demonstrated, where the conformational change of a thin layer (1um) of immobilized DNA can lead to significant switching of the waveguide transmittance.			
	17:00-17:15	**One-Pot Synthesis of Stabilizer-Free Ag-Graphene Nanocomposite and Its Potential**	Weiyin Gao, Minqiang Wang, Chenxin Ran, Jijun Ding, Jianping Deng, Yajing Li	Nanophotonics I – TuB5	Diamond II

		Application on Photodegradation of RhB TuB5.7			
		Abstract− Simultaneous reduction of graphene oxide (GO) and silver nitrate (AgNO3) into stabilizer-free Ag-Graphene Naoncomposite (AGN) using DMAc-assisted thermal reduction method with controllable density of Ag nanoparticles (Ag NPs) is reported. Microscopy techniques (scanning electron microscopy and high-resolution transmission electron microscopy) have been employed to probe the morphological characteristics of AGN and the lattice plane of Ag NPs. We observed a significant improvement on adsorption ability of AGN-P25 mixture compared with bare P25, indicating potential application on photocatalysis of AGN.			
	17:10-17:30	**Integration Nano-Optical Waveguide for Sensing Application*** TuBS1.6	Chenyang Xue	Special Track: Nanomanufacturing in China − TuBS1	Garden Wing Ballroom
		No abstract found			
	17:15-17:30	**Study on the Optimal Distribution of Redundancy Effort in Cross-Layer Reliable Architectures** TuB4.8	Nivard Aymerich, Antonio Rubio	Nanoelectronics: Circuits and Architecture I − TuB4	Jade III
		Abstract− This paper presents a comprehensive approach to the smart application of redundancy techniques in multiple- layer hierarchical systems. Computing systems today are rapidly evolving into increasingly complex structures with an ever-increasing number of components. Moreover, future technology generations are expected to have associated lower levels of quality. For these reasons, it is emerging nowadays a renewed interest in the development of reliable architectures. In this work we delve into this topic putting special emphasis on the system hardware hierarchy. We analyze the advantages in terms of reliability of distributing redundancy effort in cross-layer systems. We base our analysis on a general fault model that takes into account both devices and interconnections. Using the Rent's Law we relate the number of devices and interconnections for different configurations of redundancy and compare the global error probability. Our results provide meaningful information about the benefits that can be achieved by properly choosing the system layer at which to apply redundancy, and if applicable, the optimal distribution of redundancy effort through the system layers.			
	17:15-17:30	**Optical Properties of Silver Nanorods by Adjusting Aspect Ratio in Experiment and Simulation** TuB5.8	Zhi Yang, Minqiang Wang, Guodong Yan, Xiangyu Zhang, Jijun Ding	Nanophotonics I − TuB5	Diamond II
		Abstract− In order to understand surface plasmon resonance of anisotropic metal nanocrystals, we have produced Ag nanorods with well-controlled aspect ratio by soft template method with seed-mediated. The aspect ratio of synthesized Ag nanorods can be tuned flexibly by changing the amounts of seeds. This provides a convenience for studying localized surface plasmon resonance (LSPR) properties of Ag nanorods. Based on these excellent properties, we calculated the extinction spectrum and electrical field distribution of Ag nanorods near the AgNCs by discrete dipole approximation (DDA) method and investigated the effect of incident and polarization direction on far-field and near-field characteristics. These results could be helpful for us to take the advantage of excellent optical properties on optoelectronic and biomedical field.			
	17:15-17:30	**Development of a Nanorobotic Station for Electrophysiology under Nanomechanical Stimulation** TuB3.7	Runhuai Yang, King Wai Chiu Lai, Yuqiang Fang, Ning Xi, Jie Yang	Nanorobotics − TuB3	Jade II
		Abstract− In this paper, the development of a nanorobotic station for acquisition of cellular electrical and mechanical information is reported. This station involves the development of a nano-manipulation platform and a planar patch-clamp module. The nano-manipulation platform not only enable the observation of biological cells, but also has the ability to give a precise pico-Newton force stimulus on a certain position of cells. The membrane potential of cells can be recorded by the patch clamp module. The module also has the ability to generate electric stimulus to the biological cells. This station provides a method to research both mechanical and electrical properties of living cells.			
	17:15-17:30	**Metamaterial Sensor Platforms for Terahertz DNA Sensing** TuB6.8	Nan Zheng, Mahdi Aghadjani, Kyungjun Song, Pinaki Mazumder	Nanobiosensors − TuB6	Diamond III
		Abstract− Three high-sensitivity metamaterial Terahertz DNA sensors based on resonance are proposed to distinguish DNA molecule with different refractive indices. Both			

		numerical electromagnetic method and physical circuit model interpretation are employed to analyze proposed sensor structures. Design guideline based on intuitive physical circuit model is provided and verified through full-wave simulation.			
	17:18-17:36	**Mixed Conducting Perovskite Films in Resistive Switches and Micro-Solid Oxide Fuel Cells Devices*** TuBS2.7	Rupp Jennifer	Invited Session: Nanoassemblies and Devices – TuBS2	Jade I
		No abstract found			
Thursday, August 8, 2013	08:30-08:45	**Dynamical Mechanism of Formation of Fe Nanoparticles in Tin Bronze Alloys** ThA1.1	Mingwen Chen, Wenlong Zhang, Longfei Zuo, Bin Hou, Zidong Wang	Nanomaterials: Nanomaterial/nanoparticles Synthesis I – ThA1	Jade I
		Abstract– The dynamical mechanism of formation of nanoparticles during the solidification of molten Tin bronze melt is investigated. Since the melting depth phenomenon occurs immediately after nucleation during the initial stage of solidification under the influence of anisotropic surface tension, some parts on the surface of the Fe nucleus move first inward up to a melting depth distance, then start to move outward with other parts. The melting depth induced by the anisotropic surface tension leads to that the inner diameter of the Fe nucleus is less than two times its critical radius for nucleation and some parts present weaker strength than other parts. When a forced flow by stirring and centrifugal means etc. is exerted on the molten Tin bronze melt, the Fe nucleus is dragged or distorted when it grows, and then the Fe nucleus is broken into more fine Fe nanoparticles. Due to the interaction between the convection and the anisotropy of surface tension, a great number of Fe nanoparticles form during the solidification of molten Tin bronze melt and dispersedly strengthen the Tin bronze alloys.			
	08:45-09:00	**Highly Luminescent ZnS: Mn/ZnS Core Shell Nanoparticles for Solid State Lightning** ThA1.2	Manoj Sharma, Xueyong Wei	Nanomaterials: Nanomaterial/nanoparticles Synthesis I – ThA1	Jade I
		Abstract– This paper presents some results from a study of luminescent properties of core shell zinc sulphide (ZnS) nanoparticles (NPs) with the Mn doped core and ZnS as the shell. Influencing factors like core shell structure and dopant concentration are tuned to investigate the effects on their luminescent properties. Results indicate that these luminescent nanoparticles potentially can be used in LEDs.			
	09:00-09:15	**Graphene-Supported Silver Nanoparticles for Electrocatalytic Oxygen Reduction** ThA1.3	Hongliang Sun, Guolong Lu, Hongbin Lv, Zhenning Liu	Nanomaterials: Nanomaterial/nanoparticles Synthesis I – ThA1	Jade I
		Abstract– ***Abstract***—In order to improve the electrocatalysis of oxygen reduction and reduce the captive cost of microbial fuel cell (MFC), graphene-supported catalyst of silver nanoparticles (Ag/RG) was prepared and its activity toward oxygen reduction reaction (ORR) in pH-neutral condition was examined. The Ag/RG catalyst was prepared by chemical reduction of aqueous silver ions to silver nanoparticles on the surface of reduced graphene (RG), which was obtained from graphene oxide (GO) precursor synthesized via classic Hummer's method using graphite as starting material. The results demonstrated that aqueous co-reduction method could yield high-quality Ag/RG catalyst, in which Ag nanoparticles were dispersed on the graphene surface with average diameter of 13 nm as revealed by XRD and TEM examination. The XPS results suggested the presence of polar oxygen-containing functional groups on the graphene sheets could provide the nuclei to form Ag nano-structure. The CV results showed that Ag/RG was active of catalyzing ORR electrochemically in pH-neutral electrolyte. Since Ag costs much less than Pt, Ag/RG is expected to hold remarkable potential as a promising alternative to promote the commercialization of MFC for practical application. ***Index Terms***—*Graphene; Ag nanoparticle; pH-neutral electrolyte; oxygen reduction reaction; microbial fuel cell*			
	09:15-09:30	**Layered Metal Systems Inside Multi-Walled Carbon Nanotubes by in Situ Filling Technique** ThA1.4	Yasuhiko Hayashi, Tomoharu Tokunaga	Nanomaterials: Nanomaterial/nanoparticles Synthesis I – ThA1	Jade I
		Abstract– Here we demonstrate the layered Pd/Fe/Co systems inside multi-walled carbon nanotubes (MWCNTs) on Si situ filling technique using a microwave plasma chemical vapor deposition (MPCVD). The detail characterization of structure as well as magnetic induction component of layered Pd/Co or Pd/Fe/Co systems inside MWCNTs were performed by transmission electron microscopy (TEM), and energy dispersive X-ray spectroscopy. Off-axis electron holography in the TEM was used to correlate the			

		magnetic microstructure of magnetite of layered Pd/Co or Pd/Fe/Co system inside individual MWCNTs.			
	09:30-09:45	**Fabrication of Gold Multi-Electrode Array with Bi-Layer Lift-Off Resist Technique and Surface Modification with Gold Nanoparticles by Electrochemical Deposition** ThA1.5	Yong Hee Kim, Nam Seob Baek, GookHwa Kim, Ah-Young Kim, Younghwan Han, Sang-Don Jung	Nanomaterials: Nanomaterial/nanoparticles Synthesis I − ThA1	Jade I
		Abstract− Electrochemical deposition of gold nanoparticles (Au NPs) on the gold multi-electrode array (MEA) fabricated with bi-layer lift-off resist sputter-deposition technique was performed. Electrochemical deposition was performed by potentiostatic and cyclic voltammetry method. The surface of Au NP-modified electrode showed various morphologies with applied voltage and the concentration of HAuCl4 solution. The Au NP-modified electrode was characterized by electrochemical impedance spectroscopy and cyclic voltammogram. The performance of Au NP-modified MEA was also tested by neuronal signal recording. The Au NP-modified MEA exhibited lower baseline noises and can record neuronal spike signals longer than the bare Au MEA.			
	09:45-10:00	**Simulation of Soot Nanoparticles Formation and Oxidation in Non-Premixed Methane-Air Flame at an Elevated Pressure** ThA1.6	Masoud Darbandi, Majid Ghafourizadeh, Somaye Jafari	Nanomaterials: Nanomaterial/nanoparticles Synthesis I − ThA1	Jade I
		Abstract− In this work, a hybrid finite element volume FEV method is further extended to simulate soot nanoparticles formation and oxidation in a heavily sooting co-flow methane diffusion flame at elevated pressure. In this regard, two-equation soot model is used and soot oxidation due to O2 is further taken into account. Considering full soot oxidation and respecting the physics of the flow, physical upwinding influence scheme PIS for approximation of soot mass fraction fluxes over cell faces is further extended. To describe soot nucleation process, phenyl-route, based on soot inception from polycyclic aromatic hydrocarbons PAHs, is used and a further kinetics scheme, which consists of 80 chemical species and 1416 chemical reactions, is employed. The flamelet combustion model, Two-equation standard k-ϵ turbulence model and suitable wall functions are applied. Using probability density functions PDFs, turbulence-chemistry interaction is taken into account. Radiation effects of both gases and soot are taken into account assuming optically thin limit. Using bi-implicit approach, the governing equations are solved thorough two different sequential matrices. Comparing with the measured data, the current solution successfully predicts the essential characteristics of flame and soot nanoparticles.			
	10:00-10:15	**Space-Charge Dynamics in a Semiconductor Nanoparticle and Its Potential for Terahertz Applications** ThA1.7	Thomas T Y Wong, Tao Shen, Ming Yan	Nanomaterials: Nanomaterial/nanoparticles Synthesis I − ThA1	Jade I
		Abstract− Adjustable carrier concentration is an attractive feature of semiconductor nanoparticle that allows its surface plasmon resonance to be tuned. While quasi-static treatment of the electromagnetic interactions with the charge species can account for the polarization process in a conductive nanoparticle, a full-wave solution of the Maxwell's equations is needed to give a realistic portrait of the current distribution when the nominal charge density exceeds 10**20 cm**-3 in a typical nanoparticle. The analysis can be facilitated by the use of equivalent circuits, which readily give the induced dipole moment on a semiconductor nanoparticle in terms of material parameters and the radius of the particle. Prospects of semiconductor nanoparticles in terahertz technology are highlighted.			
	10:15-10:30	**Liquid Pulsed-Discharge Synthesis and In-Situ Crystallization Study of Ni-P Nanoparticles** ThA1.8	Yuanyuan Tan, Dongbai Sun, Bin Yang, Yu Gong, Shi Yan, Rong Du, Xueqing Xing, Zhongjun Chen, Quan Cai, Zhonghua Wu, Hongying Yu, Guang Mo	Nanomaterials: Nanomaterial/nanoparticles Synthesis I − ThA1	Jade I
		Abstract− The crystallization behavior of amorphous Ni-P nanoparticles produced by liquid pulsed-discharge was studied by using in situ high temperature XRD at beamline 4B9A of Beijing Synchrotron Radiation Facility. Transmission electron microscope (TEM) was used to observe the morphology and Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) was used to analyze the chemical composition of the as-prepared Ni-P nanoparticles. TEM results show that the average size of the as-prepared nanoparticles is about 13.5 nm. ICP-AES identifies the Ni-P nanoparticles contain 13.16 wt. % (21.85 at. %) of P and 86.84 wt. % (78.15% at. %) of Ni. Eight XRD patterns were, respectively, collected at 300, 373, 473, 573, 673, 773, 873 and 973K under low-vacuum condition (0.1 Pa). XRD results show that the as-prepared Ni-P nanoparticles are amorphous, no peaks of crystalline phases can be observed until 573K. Afterwards, the crystallization of the amorphous phase undergoes the formation and decomposition of some metastable phases. Finally, the obtained stable phases are the bct Ni3P and fcc Ni cryatalline phases. Both are randomly distributed in the sample. The crystallization mechanisms of the as-prepared amorphous Ni-P nanoparticles has also been discussed at the end of this paper.			