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Part I Conference Schedule

Time: January 3-5, 2017
Location: Arnoma Grand Bangkok (曼谷阿诺玛酒店), Bangkok, Thailand

Date	Time	Lobby			
Jan. 3	**14:00-17:00**	**Registration**			
Date	**Time**	**TBD**	**TBD**		
Jan. 4	**08:00-12:00**	**Plenary Speeches: Material Series I** **Chair: TBD** **Group photo & Coffee Break: 10:00-10:20**	**Invited Session 3: Physics Series I** **Chair: TBD** **Group photo & Coffee Break: 10:00-10:20**		
	12:00-13:30	**Lunch** [Mango 99, Lobby floor, Arnoma Grand Bangkok]			
Date	**Time**	**TBD**	**TBD**	**TBD**	
Jan. 4	**14:00-18:00**	**Invited Session 1: Material Series II** **Chair: TBD** **Coffee Break: 16:00-16:20**	**Invited Session 2: Material Series III** **Chair: TBD** **Coffee Break: 16:00-16:20**	**Invited Session 4: Physics Series II** **Chair: TBD** **Coffee Break: 16:00-16:20**	
	18:00-19:30	**Dinner** [Mango 99, Lobby floor, Arnoma Grand Bangkok]			
Jan. 5	**08:00-12:00**	**Technical Session 1: Material Series IV** **Chair: TBD** **Coffee Break: 10:00-10:20**	**Technical Session 2: Material Series V** **Chair: TBD** **Coffee Break: 10:00-10:20**	**Technical Session 3: Material Series V** **Chair: TBD** **Coffee Break: 10:00-10:20**	**Technical Session 4: Physics Series III** **Chair: TBD** **Coffee Break: 10:00-10:20**
	12:00-14:30	**Lunch** [Mango 99, Lobby floor, Arnoma Grand Bangkok]			

Part II Plenary Speeches

Material Series I

Plenary Speech 1: Making the Hospital a Safer Place by the Sonochemical Coating of the Textiles with Antibacterial Nanoparticles

Speaker: Prof. Aharon Gedanken, Bar-Ilan University, Israel
Time: 08:00-08:40, Wednesday Morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract

Sonochemistry is an excellent technique to coat nanomaterials on various substrates, imparting new properties to the substrates. After a short demonstration of coating NPs on ceramics and stainless steel, I'll present the coating of textiles such as polyester, cotton, and nylon. In all cases a homogeneous coating of NPs was achieved. Silver is known for generations as antibacterial, and indeed the Ag NPs have killed the gram-negative E. Coli (strain 1313) as well as the gram-positive Staphylococus aureus (strain 195) bacteria very efficiently. Lately, the FDA shows less enthusiasm towards nanoAg, as a result, we have moved to NPs of ZnO, and CuO as antibacterial agents. They were coated on the above-mentioned fabrics and showed excellent antibacterial properties. The coated textiles were examined for the changes in the mechanical strength of the fabric. A special attention was dedicated to the question whether the NPs are leaching off the fabric when washed repeatedly. The coated ZnO NPs on cotton underwent 65 washing cycles at 92 ^{0} C in water in a Hospital washing machine, no NPs were found in the washing solution and the antibacterial behavior was maintained. Recently, an experiment was conducted at PIGOROV Hospital in Sofia, Bulgaria in which one operation room was equipped with antibacterial textiles, namely, bed sheets, pajamas, pillow cover, and bed cover. 22 Patients in this operation room were probed for bacterial infections. Their infection level was compared with 17 control patient that were using regular textiles. The results are demonstrating that a lower infection level is observed for those patient exposed to the antibacterial textiles. Lately, we have synthesized NPs of a new material, $Cu_{0.89}Zn_{0.11}O$ that kills bacteria 10,000 times better than ZnO or CuO. The mechanism of the killing was studied and will be presented.

Coating of Catheters with the above mentioned NPs were performed and the coated catheters were inserted in rabbits. Results showed that the urine of the rabbits was not contaminated with bacteria and the growth of biofilm on the Catheters is avoided.

Plenary Speech 2: Reflections on Rust: Iron Oxide Photoelectrodes for Solar Energy Conversion and Storage

Speaker: Dr. Avner Rothschild, Technion – Israel Institute of Technology, Israel
Time: 08:40-09:20, Wednesday Morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Photoelectrodes for solar water splitting must employ a semiconductor material with exceptional stability against (photo)corrosion and (photo)decomposition, as well as visible-light absorption. On top of that, it should also be abundant, inexpensive and non-toxic. Iron oxide (□ -Fe_2O_3, hematite) is one of few materials meeting these criteria, but its poor transport properties and fast recombination present challenges for efficient charge carrier generation, separation and collection.
We explore an innovative solution to these challenges using ultrathin (20-30 nm) quarter-wave films on specular back reflectors [1]. This simple optical cavity design (Fig. 1) effectively traps the light in otherwise nearly translucent ultrathin films, amplifying the intensity close to the surface wherein photogenerated charge carriers can reach the surface and split water before recombination takes place. This is the enabling key towards the development of high efficiency ultrathin film hematite photoanodes.In this talk I will present new advances in the development of high efficiency thin film hematite photoanodes, including: The effect of different dopants and doping levels [2]; heterogonous doping profiles [3]; heteroepitaxial thin films of high crystallinity and specific orientations [4]; concentrated solar water splitting [5]; and PEC-PV tandemcells for solar water splitting.

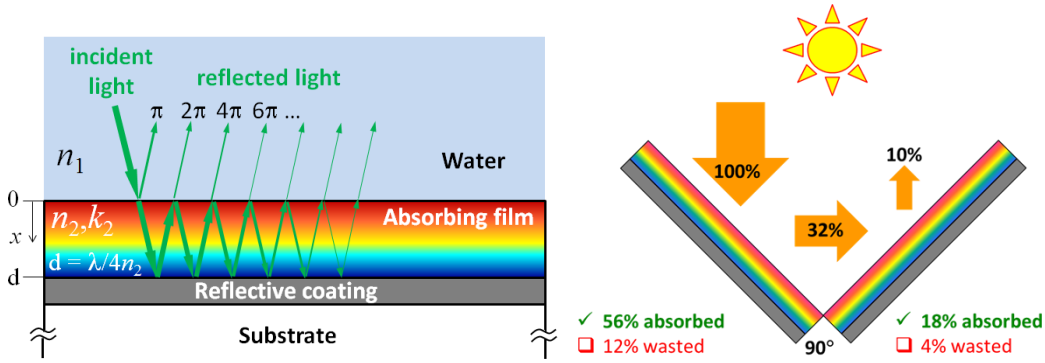


Figure 1. Resonant light trapping in ultrathin films [1].

[1] Hen Dotan, … **Avner Rothschild**, Resonant light trapping in ultrathin films for water splitting, *Nature Materials* 12, 158-164 (2013).

[2] Kirtiman Deo Malviya, … **Avner Rothschild**, Systematic comparison of different dopants in thin film hematite (□ -Fe_2O_3) photoanodes for solar water splitting, *Journal of Materials Chemistry A* 4, 3091-3099 (2016).
[3] Asaf Kay, … **Avner Rothschild**, Heterogeneous doping to improve the performance of thin film hematite photoanodes for solar water splitting, *ACS Energy Letters* (under review).
[4] Daniel Grave, … **Avner Rothschild**, Heteroepitaxial hematite photoanodes as a model system for solar water splitting, *Journal of Materials Chemistry A* 4, 3052-3060 (2016).
[5] Gideon Segev, … **Avner Rothschild**, High solar flux concentration water splitting with hematite (□ -Fe_2O_3) photoanodes, *Advanced Energy Materials*6, 1500817 (2016).

Plenary Speech 3: Enhancement of gas barrier and electro-catalytic properties of electroactive epoxy resins by incorporation of reduced graphene oxide platelets for anticorrosive coating application

Speaker: Prof. Juiming Yeh, Chung Yuan Christian University
Time: 09:20-10:00, Wednesday Morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
In this paper, a series of electroactive epoxy/reduced graphene oxide (rGO) composite (EGC) coatings were prepared and first applied in the corrosion protection application. First of all, the amine-capped aniline trimer (ACAT) was synthesized by oxidative coupling reaction of aniline with 4,4'-diaminodiphenylamine. Subsequently, the electroactive EGC coatings can be obtained by thermal ring-opening polymerization of DGEBA with ACAT/T-403 in the presence of rGO at specific heating program. The characterization of rGO, EGC can be performed by FTIR, SEM and XRD. The dispersion capability of rGO platelets existing in electroactive epoxy matrix was identify by transmission electron microscopy (TEM). The electroactivity of as-prepared epoxy composite coatings were investigated by electrochemical cyclic voltammetric studies.
Enhancement of Corrosion protection of electroactive epoxy coating (EC) by incorporation of rGO platelets was investigated by performing a series of electrochemical corrosion measurements in saline condition. It should be noted that the incorporation of rGO might into EC was found to effectively promote the corrosion performance of EC, which might be associated with the enhancement of gas barrier and electro-catalytic properties of electroactive EC resulted from the incorporation of rGO platelets.

Plenary Speech 4: Preparation of chitin nanofibers extracted from crab shell for reinforcement filler of plastics

Speaker: Dr. Shinsuke Ifuku, Tottori University, Japan
Time: 10:20-11:00, Wednesday Morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
After cellulose, chitin is the second most abundant biomacromolecules in nature, existing mainly in the exoskeletons of crabs and shrimps. We have recently isolated chitin nanofibers from the exoskeletons of crabs by a mechanical process. The obtained chitin nanofibers have a highly uniformstructure of 10 nm in width and a high aspect ratio. As chitin nanofibers consist of an antiparallel extended crystalline structure, they have excellent mechanical properties, including a high Young's modulus, high fracture strength and low thermal expansion. In this study, optically transparent chitin nanofiber composites were fabricated with 11 different types of (meth)acrylic resins. Chitin nanofibers significantly increased the Young's moduli and the tensile strengths, and decreased the thermal expansion of all (meth)acrylic resins due to the reinforcement effect of chitin nanofibers having an extended crystal structure.

Plenary Speech 5: First-Principles Theoretical Design and Analysis of Graphene Layers for Sensing Application

Speaker: Prof. Yoshitaka Fujimoto, Tokyo Institute of Technology, Japan
Time: 11:00-11:40, Wednesday Morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Defects in carbon-based nanomaterials such as graphene and nanotubes could modify their electronic properties. Such functionalized carbon-based nanomaterials by controlling defects might provide novel nanoelectronics applications. Thereby, graphene doped with heteroatoms have also received much attention from the viewpoint of basic nanoscience and applicable nanotechnology since heteroatom dopants can change substantially the electronic properties of graphene.
I will talk about our theoretical works of doping and adsorption effects on the stabilities and the electronic properties of graphene layers, based on the first-principles electronic-structure study within the density-functional theory.

Plenary Speech 6: How to Go Smart with Concrete

Speaker: Prof. Harald Justnes, SINTEF Building and Infrastructure, Norway
Time: 11:40-12:20, Wednesday Morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Concrete is the most man-made "material" after purified water and the most common construction material. The popularity is earned by its versatility and because it is affordable being made out of cement, sand, gravel and water. Being a bulk commodity, cement is very cheap costing around 100 € per ton in Europe. Hence, if one want to go smart with concrete you can either add something cheap in large quantity (>5% of cement mass) called additive or something expensive in small quantity (<5 % of cement mass) called admixture that will enhance one or several properties of the concrete.
In this review examples of beneficial admixtures and additives are given for the concrete properties 1) rheology in fresh state, 2) strength evolution and 3) durability. Examples are also given for how smart combinations of cheap additives can give synergistic effects in terms of strength.

Part III Invited Sessions

Invited Session 1: Material Series II

Invited Speech 1: Functional Nanoparticles for Biochemical Analysis Using Magnetic Immunoassay

Speaker: Prof. C. Bor Fuh, National Chi Nan University
Time: 14:00-14:30, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Functional nanoparticles have been widely used for various applications of industry, biochemistry and biomedicine. The advantages of functional nanoparticles have been known and gradually used in many new applications. This presentation would show several biochemical analyses using functional nanoparticles with emphasis on magnetic immunoassay. Several model biomarkers would be used to demonstrate the applications of this technique. In comparison with other methods, this method has lower detection limit and wider linear range. This technique has great potential to provide a simple, fast, sensitive, and selective analysis for particles, proteins, and other biomaterials.

Invited Speech 2: Layered heterostructures for functionalization of graphene

Speaker: Dr. Chan-Cuk Hwang, Pohang Accelerator Laboratory, Republic of Korea
Time: 14:30-15:00, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Graphene has intriguing band structure. Its conduction and valence bands meet together at a Dirac point and the energy depends linearly on the wave vector near the K-points. However, real graphenes often show different electronic structures from the simple one depending on what they are interfacing with. This indicates that we are able to tune graphene's electronic structure by engineering its interface for specific applications. In this talk, we will show how graphene's electronic structure can change depending on substrates, such as Cu and Ni, using angle-resolved photoemission spectroscopy (ARPES) at the Pohang

Accelerator Laboratory (PAL) and scanning tunneling microscopy. The electronic structures changed by substrate can be further altered by intercalating or adsorbing foreign atoms. We provide ARPES data for the intercalation of alkali and alkaline earth metals between graphene and substrate together with additional overlayer formation in the case of alkaline earth metals. Such layered heterostructures could be useful to give a valuable function to graphene, for examples, possible superconductivity, photoluminescence, etc., that we do not generally expect in graphene.

Invited Speech 3: Nano-optical imaging with Tip-Enhanced Raman Spectroscopy

Speaker: Dr. Prabhat Verma, Osaka University, Japan
Time: 15:00-15:30, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

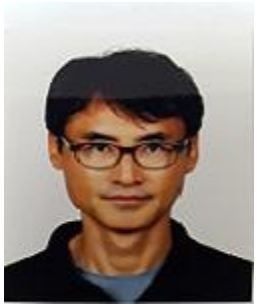
Abstract
Visible light can interact directly with the electronic or vibronic system of a sample and can extract rich information related to the intrinsic properties of the sample. This is the reasons why optical techniques, such as Raman spectroscopy, have always been convenient tools for analyzing and imaging various materials. However, Raman microscopy in its conventional form is not suitable for analyzing and imaging nanomaterials due to two major reasons. First, the poor spatial resolution restricted by the diffraction limits of the probing light, makes it impossible to analyze materials smaller than about half of the wavelength (about 200-300 nm for visible light). And second, due to the extremely small volume of nanomaterials, Raman scattering intensity is extremely weak for such samples. However, when conventional Raman microscopy is combined with the near-field techniques, it achieves new and exciting features as it goes beyond the conventional limits of optical microscopy, in terms of both the spatial resolution and scattering intensity. This can be done by utilizing the technique of tip-enhanced Raman spectroscopy (TERS), which is based on plasmonic enhancement and confinement of light field near the apex of a sharp metallic nanotip for characterizing and imaging samples at nanoscale. This plasmonics-based technique allows us to have a spatial resolution down to about 10 nm in optical nanoimaging.
Here, I will show how such a high spatial resolution in TERS is obtained and how it can be useful in various applications. The spatial resolution, however, can be further improved if we combine TERS with some other mechanism. One of such examples is the inclusion of tip-applied pressure in TERS, which distorts the sample locally, where we have shown that a spatial resolution better than 4 nm can be achieved. Further, I will discuss some techniques to obtain background-free nanoimaging in TERS.

Invited Speech 4: A new way of controlling local magnetic field in a nano junction

Speaker: Prof. Santanu K. Maiti, Indian Statistical Institute, India
Time: 15:30-16:00, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
A new proposal is given to control local magnetic field in a nanojunction. In presence of finite bias a net circular current is established in the nano ring which induces a magnetic field at its center. Allowing a direct coupling between two electrodes, due to their close proximity, and changing its strength we can regulate circular current as well as magnetic field for a wide range, without disturbing any other physical parameters. We strongly believe that our proposal is quite robust compared to existing approaches of controlling local magnetic field and can be verified experimentally.

Invited Speech 5: Graphene would prevail as an ideal material for practical SERS substrates?



Speaker: Prof. Nam-Jung Kim, University of Missouri-Columbia, USA
Time: 16:20-16:50, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
In this talk, I will present overview of recent development of graphene-enhanced Raman spectroscopy (GERS) and discuss potential applications across a variety of scientific fields. For practical uses, GERS sensing ability should meet all the standards such as sensitivity, reliability, durability, and uniformity as is the same for metal-based surface-enhanced Raman spectroscopy (SERS). Graphene has an intrinsic advantage to hold the reliability, durability and uniformity because of its atomically flat surface and mechanical strength. With no plasmonic excitation or electromagnetic enhancement on the graphene, only chemical enhancement will give rise to SERS signals normally by one or two orders of magnitude. Thus, graphene as a SERS substrate would be ideal for studying chemical enhancement mechanism isolated from the commonly dominant electromagnetic enhancements. On the other hand, in order to increase the sensitivity reaching a single molecule level, reproducible activation of electromagnetic hotspots without compromising the benefits from graphene may be needed. There have been several methods to combine graphene with other SERS-active materials or modify the graphene substrates for enhanced performance. Recent efforts to make graphene-plasmon hybrid SERS systems will be exploited and followed by further discussion on the future direction of GERS.

Invited Speech 6: Application of Gas Sensors in Medical Science: Scope and Challenges

Speaker: Dr. Mrinal Pal., CSIR-Central Glass and Ceramic Research Institute, India
Time: 16:50-17:20, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Since the time of the ancient Greeks, gas analysis of human expiration has been explored for getting important information on the state and functioning of different human organs, decomposition of some pathologic states or exacerbation of chronic diseases. It is possible, through breath odour to identify the sweet, fruit like scent of acetone, and hence the underlying diabetes of a patient, the stench attributable to a lung absyss and the fumes of ammonia, an indication of kidney disease. In fact a quantitative determination of O2and CO2 in the expiration characterizes gas-interchange functions of the blood and lungs. Exhale breath contains more than 1000 VOC's and few of them are established as biomarker. However, the challenges remain in the detection of those biomarkers having concentration from ppm to ppt level in exhale breath. Breath analysis has benefits like noninvasive, easy, point of care diagnosis. This method has obvious shortcomings in the application because of complex character of breath and resolution to distinguish between healthy person and a patient. In this talk an overview of breath analysis using semiconductor gas sensor will be presented.

Invited Session 2: Material Series III

Invited Speech 7: Sonication-assisted fabrication of metal doped BiFeO3 nanoparticles and investigation of their magnetic properties

Speaker: Dr. Bashir Ahmmad ARIMA, Yamagata University, Japan
Time: 14:00-14:30, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
We present a simple technique to fabricate multiferroic nanoparticlesfrom the bulk powder materialsby using ultrasonic energy. The bulk ceramic samples, with nominal composition of Bi0.9Gd0.1Fe1–xTixO3and Bi0.7Ba0.3Fe1-xTixO3 (x=0.00-0.25), were synthesized initially by conventional solid state

reaction technique. Then, the nanoparticles of the samples were prepared by ultrasonic fragmentation of the bulk power. The particles size of Bi0.9Gd0.1Fe1–xTixO3 was studied as a function of sonication time with TEM imaging and electron diffraction. These confirmed the formation of a large fraction of single-crystalline nanoparticles with a mean size of 12 nm. The synthesized nanoparticles exhibited a significantly improved magnetic behavior compared to their bulk counterparts at room temperature.Also, a large difference between the magnetic properties of nanoparticle and bulk powderwas observed forBi0.7Ba0.3Fe1-xTixO3 sample. The X-ray diffraction patterns demonstrated the presence of significant number of impurity phases in the bulk materials. Interestingly, these secondary phases were removed due to sonication of the bulk powder materials for 60 min.Moreover, X-ray photoelectron spectroscopy showed reduced oxygen vacancies in the nanoparticles compared to the bulk sample. Reduced oxygen vacancies resulted reduced leakage current and improved ferroelectric properties. We believe that the observe improvement of samples purity via the ultrasonic method may be promising to fabricated a wide range of functional nanomaterials.

Invited Speech 8: The structure of natural biocomposites: routes toward improving their mechanical properties

Speaker: Prof. Emil Zolotoyabko, Technion - Israel Institute of Technology, Israel
Time: 14:30-15:00, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Interplay between soft and hard components in biogenic composites attracts agreat dealof attention of numerous research groups worldwide, aimed at comprehensive understandingofthe physical origin of the improved mechanical characteristicsin these natural materials, and, first of all, the resistance to fracture.In gross mode, this is achieved by sophisticated design of stiff and compliant materials on different length scales. In mineralized biocomposites, which are considered here, the stiff and hard components are mineral particles and layers built of calcium carbonate, silica, or hydroxyapatite. In turn, protein and polysaccharide sub-layers and inclusions serve as soft and compliant components. Despite intensive research, the details of atomic interactions at the organic/inorganic interfaces and their impact on mechanical properties remainyet unclear. In order to shed additional light on this problem, we apply advanced X-ray diffraction and electron microscopy methods attempting to visualize atomic structure and nanoscale ultrastructure of biocomposites. In this paper, we present experimental results obtained for selected mollusk shells, marine sponge spicules, and human tooth dentin. On this basis, we point out specific recipes used in nature for improving mechanical properties, the recipes being different for eachbiocompositetype.

Invited Speech 9: Nanostructured ZnO Thin Films For Sensor Applications

Speaker: Dr. Anil Ramdas Bari, North Maharashtra University, India
Time: 15:00-15:30, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Nanostructured ZnO thin films were deposited onto glass substrates using ultrasonic spray pyrolysis (USP) technique. Zinc acetate was used as a starting precursor. These films were fired at 500oC. As prepared thin films were studied using XRD, AFM, TEM and EDAX to know crystal structure, size of crystallites, surface morphology, microtopography and elemental composition respectively. The absorption and photoluminescence spectroscopy was study the optical properties of the films. The crystallite size and surface roughness were observed to be increased with increase in film thickness. The band gap was observed to be decreased with increase in film thickness. The gas sensing performance of the nanostructured ZnO thin films, sprayed for different intervals of time, was studied on exposure of various conventional gases. The films were observed to be most sensitive to Liquid Petroleum Gas at 300oC. The photoconductivity was studied under different light intensity. It decreases with increase in film thickness.

Invited Speech 10: Biodegaradable nanoporous microspheres by RAFT polymerization

Speaker: Prof. Ildoo Chung, Pusan National University, South Korea
Time: 15:30-16:00, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Triblock copolymers based on polycaprolactone (PCL) and photodegradable poly(methyl vinyl ketone) (PMVK) were synthesized and characterized. First, PCL based triblock copolymer was synthesized by RAFT polymerization followed by the fabrication of microsphere by emulsion method.Nanoporous microspheres based on PMVK-b-PCL-b-PMVK block copolymers were fabricated by photodegradating PMVK blocks by UV irradiation and evaluated their surfaces and internal structures by electron microscopies.Fabricated microspheres had uniform size particles with approximately 5 um in diameter, and those from block copolymers had a nanoporous structures after UV exposure, while PCL microspheres had kept smooth surfaces. Spherical microspheres were gradually changed to disk-shaped forms as UV irradiation time increased, owing to collapsing of PMVK blocks by UV irradiation.

Invited Speech 11: Novel technologies for sustaining drug release to the eye

Speaker: Dr. Thakur Raghu Raj Singh, Queens University Belfast, UK
Time: 16:20-16:50, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Delivery of drug molecules to treat visually impairing ocular diseases that originate in the posterior segment of the eye has been an extremely challenging task for pharmaceutical scientists and retinal specialists. The posterior segment cannot be treated using topical formulations, as they are incapable of reaching the required site of action, thus intravitreal injections have become the standard delivery method, but due to their invasive nature multiple adverse effects are associated. To overcome current issues, we have designed minimally-invasive microneedle-based devices for delivery of in situ implant forming sustained drug release formulations. The microneedle devices enable to overcome the barrier function of the ocular tissues and causes minimal tissue damage unlike hypodermic needles, whilst the sustain release formulations allow localised drug delivery for long-term. Therefore, our approach offers a new method of drug delivery to the eye that can overcome the current drug delivery issues and also enhance patience compliance.

Invited Speech 12: Novel technologies for sustaining drug release to the eye

Speaker: Prof. Bhupendra Dev, Indian Association for the Cultivation of Science, India
Time: 16:50-17:20, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Transition metal silicides have played an indispensable role in the development of microelectronics. In microelectronic devices, metal silicides, e.g., titanium silicide, nickel silicide, cobalt silicide etc. are used as interconnects, Ohmic contacts, Schottky barrier contacts, and gate electrodes. Synthesis and properties of nanoscale metal silicides on silicon are of tremendous current interest for applications in nanoelectronics. With the dimensions of the nanostructures in the quantum regime it is possible to enter into the realm of quantum devices. We first address the growth of self-organized quantum wires and the fundamental physics behind it with an example of CoSi2 growth on Si surfaces [1, 2]. Next we will discuss a case of aligned FeSi2 nanowire growth utilizing the two-fold symmetry of a Si(110) substrate [3]. These materials have been grown in a molecular beam epitaxy (MBE) system using reactive deposition epitaxy (RDE), where sub-monolayers of metal were deposited on hot Si substrates and the nanostructures have grown in a self-organized way. A proposal for the fabrication of a nanoscale lateral permeable base transistor will be discussed. Finally, a case of nickel monosilicide (NiSi) growth via ion irradiation will be discussed. NiSi has emerged as an excellent material of choice for source-drain contact applications below 45 nm node complementary metal oxide semiconductor (CMOS) technology [4]. However, there are major

experimental challenges in growing uniform single phase nickel monosilide on silicon. We show that these challenges can be overcome and a uniform nanoscale single phase NiSi film can be grown by irradiating a Ni film, grown on Si, with an energetic ion beam at room temperature.

References

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[3] Debolina Das, J. C. Mahato, Bhaskar Bisi, B. Satpati, and B. N. Dev, Appl. Phys. Lett. 105 (2014) 191606.
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Invited Speech 13: Novel technologies for sustaining drug release to the eye

Speaker: Prof. Soon-Gil Yoon, Chungnam National University, South Korea
Time: 17:20-17:50, Wednesday Afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
The Al (3 at%)-doped ZnO (AZO)/Ag/AZO multi-layer films annealed at 100 oC for 20 min under oxygen atmosphere were studied for the simultaneous realization of the electromagnetic interference (EMI) shielding and the antibacterial activity for the transparent glass panel applications. The annealed AZO (45 nm)/Ag (9 nm)/AZO (45 nm)/glass multi-layer films showed a high EMI shielding effectiveness of approximately 39 dB and a strong antibacterial activity for Escherichia coli and Staphylococcus auraus at the same time. They showed hydrophobic properties by a simple thermal annealing at 100 oC for 20 min under an oxygen atmosphere.

Invited Session 3: Physics Series I

Invited Speech 1: Acoustics & Vibration Role in Lung Therapies

Speaker: Prof. Ahmed Al-Jumaily, Auckland University of Technology, New Zealand
Time: 8:00-8:30, Wednesday morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Lung therapies vary between pharmaceutical and physical treatments depending on the nature of the diseases. The latter has gained enormous applications in particular in managing airway constrictions such as during an asthmatic attack. Pressure oscillation (PO) is a form of acoustic/vibration waves superimposed on the breathing cycle. In spite of the fact that PO has been used for lung diagnostics, it has been an innovative and effective way of treating several lung ailments including obstructive sleep apnea (OSA), asthma and respiratory distress syndrome (RDS). While lab experiments have demonstrated that length oscillations can reduce forces in contracted airway smooth muscles which are the main driving mechanism for asthma attack, it has been clinically proven that PO can modulate the upper airways to reduce the Apnea Index when used with the continuous positive airway (CPAP) device to treat OSA. Further, it has improved lung compliance, inflammatory stresses and surfactant function on patients with RDS. Professor Al-Jumaily will highlight how engineering innovation can convert acoustics/vibration principles to lung therapies and how this could be expanded further to the cell level to achieve asthma therapy.

Invited Speech 2: Photoacoustic Spectroscopic Application for the Properties of Solids

Speaker: Dr. Bimal Kumar Sarkar, Galgotias University, India
Time: 8:30-9:00, Wednesday morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Photoacoustic spectroscopic (PAS) technique can be used for investigating the properties of solids. In this technique, one has to detect the photoacoustic signal produced when a sample placed in a cell is irradiated by an intensity modulated beam of light. The amplitude and phase of the photoacoustic (PA) signal depends on the thermal and optical properties of the sample. Hence the wealth of information contained in the PA signal can be used to investigate the properties of solids. The absorption of light is essential for the generation of the PA signal, light that is transmitted or elastically scattered by the sample does not interfere with the inherently absorptive PA measurements. This enables one to work with

essentially transparent media or highly light scattering materials such as powders, amorphous solids, gels and colloids. In this work we have emphasized over the theoretical, experimental issues on the application of photacoustic spectroscopy for the investigation of the properties of solids.

Invited Speech 3: Transport Variables and Microstructure Variations Induced by Magnetohydrodynamic Convection during Resistance Spot Welding

Speaker: Prof. Peng-Sheng Wei, National Sun Yat Sen University, Chinese Taipei
Time: 9:30-10:00, Wednesday morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Resistance spot welding is an important technique often used in joining thin workpieces. This presentation theoretically and quantitatively investigates and interprets the complicated processes by realistically accounting for transient magneto-fluid mechanics, heat and species transport, and bulk resistance in workpiece, and film and constriction resistances at contact interfaces. This study shows distributions of electric current, magnetic field, temperature, velocity, and species during resistance spot welding. Since temperature gradient and solidification rate are predicted, the computed morphological parameter reflecting constitutional supercooling shows that different microstructures of the weld nugget can be controlled via designing the shapes of the electrode containing coolant hole and choosing different material properties.

Invited Speech 4: Tunable Magnetic Anisotropy in Metallic Multilayers: A Promising New Avenue to Next Generation Spintronics Devices

Speaker: Dr. Anh Nguyen, Vietnam Academy of Science and Technology (VAST), Vietnam
Time: 10:20-10:50, Wednesday morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Future spintronic devices based on spin-transfer torque (STT) require a delicate engineering of the constituent magnetic layers. While spin-transfer torque devices are typically based on either in-plane or perpendicularly magnetized materials, a tilted free or fixed layer provides additional design freedom [1,2]. Unfortunately, the tilt angle is often defined by magnetocrystalline anisotropy,

which cannot be readily tuned. We recently proposed a new ideal candidate for a tunable tilted magnetic material by using exchange-coupled in-plane/out-of-plane anisotropy system. Due to the competition between the perpendicular magnetic anisotropy (PMA) of the Co/Ni or Co/Pd multilayers and the in-plane magnetic anisotropy (IMA) of the NiFe layer, a variable magnetization tilt angle has been shown [3,4]. In order to explore underlying magnetization reversal mechanism and to further understand the control of tilt angles and uniformity of the magnetization, the exchange coupled spring systems are systematically studied with different PMA, IMA materials as well as different thickness parameters. This work provides meaningful insights to materials system with mixed anisotropies for future utilization in STT-MRAM or STO devices.

Invited Speech 5: Nuclei and Astrophysics

Speaker: Prof. Yuri Penionzhkevich, Joint Institute for Nuclear Research, Russia
Time: 10:50-11:20, Wednesday morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
In recent years, nuclear-physics investigations into the laws of the microscopic world have contributed to extend significantly our knowledge of phenomena occurring in the macroscopic world (Universe) and made a formidable contribution to the development of astrophysical and cosmological theories. First of all, this concerns the expanding-universe model, the evolution of stars, and the abundances of elements, as well as the properties of various stars and cosmic objects, including “cold” and neutron stars, black holes, and pulsars. Without claiming to give a full account of all cosmological problems, we will dwell upon those of them that, in my opinion, have much in common with nuclear-matter properties manifesting themselves in nuclear interactions.

Invited Speech 6: Geodynamo and planetary dynamo parameters from observations, scaling laws and long-time reconstructions

Speaker: Prof. Sergey V. Starchenko, IZMIRAN, Russia
Time: 11:20-11:50, Wednesday morning, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Basing on currently defined conductivity, 115 years observed evolution of the geomagnetic dipole, Faraday's and Ohm's laws I estimate averaged radial derivatives of the vortex magnetic field hidden just below the surface of the Earth's core. This allows to formulate a simple model of vortex field beneath the surface of the core and to evaluate typical

scale of the field, which determines the major geodynamo parameters and the adequacy range of the proposed simple model. Estimated scale of the vortex field (about 60 km) is much less than the typical scale resulting from the extrapolation of the observed field to the core-mantle boundary. This agrees well with the modern planetary dynamo theory, allowing direct observational estimation of the typical velocity field just beneath the surface of the Earth's core. The proposed new approach to determine the subsurface characteristics of the hidden in the depths of the physical object of the vortex magnetic field and velocity from the observed evolution of the potential field can be used for both astrophysical and for technical objects with hardly accessible electric current systems. Scaling laws for MHD dynamo in fast rotating planets and stars express the characteristic energy, hydrodynamic and magnetic values through the primary values, such as the size of the conductive core of the planet, the angular rotation rate, electrical conductivity and energy flows. Most of the earlier proposed scaling laws based only on observations and assumptions about force balances. Recent and my new approaches to fully take into account the energy and induction balance has additionally expressed here in terms of primary values such important characteristics as forces, magnitudes, energies, scales and orientations of hydromagnetic fields. The direct numerical simulation of the dynamos and modeling ability in a fairly wide range of parameters for the first time allowed direct test such laws. The obtained numerical geodynamo-like results for the Earth, Jupiter and partially Saturn postulated previously not identified analytically simplest law that predicts the field strength is only depended on the specific energy density of convection. This already widely used law was original way analytically grounded here along with other previously known and new laws. This analytic identifies the physics determining geomagnetic periodicities for jerk, secular variations and inversions/excursions. Mean period between the inversions is roughly proportional to the intensity of the geomagnetic field that is confirmed by some paleomagnetic researches. Possible dynamos in Mercury, Ganymede, Uranus and Neptune are also discussed.

This work was partly supported by Russian RFBR grant No 16-05-00507.

Invited Session 4: Physics Series II

Invited Speech 7: High-fidelity Simulation of Turbulent Reacting Flows

Speaker: Prof. Farzad Mashayek, University of Illinois at Chicago, USA
Time: 14:00-14:30, Wednesday afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract

The relentless growth in computational power has created opportunities in many areas of science and engineering where the wide ranges of spatial and temporal scales have long prevented the problems from being accurately tackled through computer simulations. One of these areas of great practical interest is the general field of turbulent reacting flow where temporal and spatial scales typically vary by several orders of magnitude. Consequently, the accurate prediction of turbulent reactive flow has remained one

of the most challenging engineering problems, despite being the subject of intense research for decades. In this talk, we first discuss some novel ideas for enhancing the performance of combustion systems. We will then focus on numerical simulation of turbulent flows using high-order spectral element methods.

Invited Speech 8: Progressive failure of masonry shear walls – a distinct element approach

Speaker: Prof. Zhuge Yan, University of Southern Queensland, Australia
Time: 14:30-15:00, Wednesday afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
Masonry is not a simple material. The influence of mortar joints as a plane of weakness is a significant feature and this makes the numerical modelling of masonry very difficult especially when dynamic (seismic) analysis is involved. In the past few years, an analytical model based on Distinct Element Method (DEM) has been developed and applied to simulate the in-plane shear behaviour of unreinforced masonry walls. In DEM, a solid is represented as an assembly of discrete blocks. Joints are modelled as interface between distinct bodies. It is a dynamic process and specially designed to model the behaviour of discontinuities. The numerical solutions obtained from DEM are validated by comparing the results with those obtained from existing experiments and finite element modelling. A parametric study is also performed to test the sensitivity of the model with various damping schemes.

Invited Speech 9: Modelling of Time-Dependent Mechanical Behaviour of Poly (lactic-acid) and Poly (butylene succinate) Blends for Stent Application

Speaker: Prof. Liguo Zhao, Loughborough University, UK
Time: 15:00-15:30, Wednesday afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
The preparation of Poly (lactic-acid) (PLA) and Poly (butylene succinate) (PBS) blends, with various PLA/PBS weight ratios, was achieved by melting and mixing technique at high temperature. Small dog-bone specimens, produced by compression moulding, were used to test mechanical properties under uniaxial tension. The elongation of PLA/PBS blends increased with the increase of PBS content, but with a compromise of tensile modulus and strength. An increase of strain rate led to enhanced

stress response, demonstrating the time-dependent deformation nature of the material. Moreover, an advanced viscoplastic model with nonlinear hardening variables was applied to simulate rate-dependent deformation of PLA/PBS blends, with model parameters calibrated simultaneously against the tensile test data. Model simulations compared well with experimental results.The viscoplastic model was further applied to simulate crimping and deployment ofscaffold in a diseased artery using the finite element method, focusing on the time-dependent deformation behaviour of the scaffold. Stress relaxation over time was particularly investigated for the whole scaffold-artery system following scaffold implantation.

Invited Speech 10: TBD

Speaker: Dr. Masaki Mizuguchi, Institute for Materials Research, Tohoku University
Time: 15:30-16:00, Wednesday afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
TBD

Invited Speech 11: SUISEI - A Versatile Global Model of Comets with Applications to Small Bodies

Speaker: Dr. Daniel C. Boice, Scientific Studies and Consulting, USA
Time: 16:20-16:50, Wednesday afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Abstract
SUISEI is a suite of computational tools have been developed over the past three decades and successfully applied to comets; including ComChem, a global, multi-fluid gas dynamics simulation with detailed chemical kinetics of the cometary coma; coupled with ComMHD, a 3-D model of the comet-solar wind interaction; ComDust, a model of comet dust evolution and interaction with gas; and ComNuc, a 3-D simulation of gas and heat flow within the porous sub-surface layers of the comet nucleus. The combination of these tools has resulted in an improved knowledge of chemical species that form in the comet's coma and their relationship to native molecules that exist in the nucleus ices by analyzing space- and ground-based observations and in situ measurements by instrumentation onboard spacecraft missions. Cometary ions mix with the solar wind as pick-up ions, eventually transported to an extensive plasma tail that may persist to 1 AU and beyond. This model is especially timely with the recent encounter of ESA's Rosetta spacecraft with Comet 67P/Churyumov-Gerasimenko which ended in September 2016. After a review of SUISEI, applications will be made to three cases: chemical recycling of HCN in cometary comae, the

phosphorous inventory of comets, and the physical conditions of the near-sun small body, Phaethon.

Invited Speech 12: TBD

Speaker: Prof. Farid ABED-MERAIM, Arts et Métiers ParisTech, Metz, France
Time: 16:50-17:20, Wednesday afternoon, January 4, 2016
Location: 3rd Floor, Arnoma Grand Bangkok

Part IV Technical Sessions

Technical Session 1: Material Series IV

Session Chair: TBD

3rd Floor, Arnoma Grand Bangkok 8:00-12:00, Thursday Morning, January 5, 2016

ID	Paper Title	Author	Affiliation
1-1 Oral	Optimization of in-plane curvilinear bundle placement for 3D printed Carbon fiber reinforced polymer composite with constraint of fibre curvature	YUSUKE YAMANAKA	Graduate school of Tokyo Institute of Technology
1-2 Oral	Analysis Method using Electric Potential Function for Calculating the Change in Electric Potential Induced by Delamination Cracks in Carbon Fiber Reinforced Polymer Composites	Takuya Yamane	Tokyo Institute of Technology
1-3 Oral	The Strength Characteristics of C/C Composite Material with Opening Hole and Typical Application	Tan Zhiyong	State Key Laboratory of Space Physics
1-4 Oral	Magnetic Responsive Soft Composite with Variable Elasticity and Its Application	Tetsu MITSUMATA	Niigata University
1-5 Oral	Preparation Process and Optimization Design for Composites Rudderpost in the Long-time High Temperature Environment	Jing Li	Science and Technology on Space Physics Laboratory
1-6 Oral	Reduced Graphene Oxide/Gold Nanoparticle Aerogel for Catalytic Reduction of 4-Nitrophenol	Xinjiang Cao	Southeast University
1-7 Oral	TiO2-Nb2O5 Nanocomposites: Effect of Surface Morphological Characteristicson Photoactivity and Environmental Applications	Mahendrasingh Pawar	Dept. of Chemistry, ACS College
1-8 Oral	Template-free Bipotentiostatic Deposition of Thermoelectric BixTey Nano Arrays	Chuan Zhao	The Univeristy of New South Wales
10:00-10:20	**Coffee Break**		
1-9 Oral	Experimental study of graphene coated metal meshes as a channel in bipolar plates	Gil Won Lee	Incheon National University

1-10 Oral	Mucoadhesive microparticles with nanostructures for prolonged retention in gastrointestinal tract	Young Bin Choy	Seoul National University
1-11 Oral	Automated microphysiomer for assessment of cytotoxicity	Joachim Wiest	cellasys GmbH - R&D
1-12 Oral	Osteogenesis of Bone Marrow Stem Cells on Polycaprolactone/Hyaluronic Acid Hybrid Microspheres	Tae Ho Kim	Hannam University
1-13 Oral	Plasmid DNA-Loaded Polycaprolactone Microspheres as Bioactive Bulking Agent for Soft Tissue Augmentation	Mi Ri Park	Hannam university
1-14 Oral	Plasmid DNA Complex-Loaded Asymmetrically Porous membrane	Sang Woo Kim	Hannam University
1-15 Oral	Dual Hepatocyte Growth Factor/Collagen Type IV-Loaded Asymmetrically Porous Matrix for Tracheal Reconstruction	Sori Lee	Hannam University

Technical Session 2: Material Series V

Session Chair: TBD

3rd Floor, Arnoma Grand Bangkok 8:00-12:00, Thursday Morning, January 5, 2016

ID	Paper Title	Author	Affiliation
2-1 Oral	A new Method for the Selection and Enrichment of Cancer Stem Cells by cotton fiber	Junhua wang	Southeast university
2-2 Oral	In vivo target bio-imaging of Alzheimer's disease by fluorescent zinc oxide nanoclusters	Lanmei Lai	Southeast University
2-3 Oral	A Highly Sensitive Diketopyrrolopyrrole-Substituted Polyfluorene as Colorimetric and Turn-Off Fluorimetric Sensor toward Fe3+ and F- Sensing	Po-Chih Yang	Yuan Ze University
2-4 Oral	Synthesis of Biodegradable Nanoparticles Based on Polyfumarateurethane for DNA Delivery	Jiin Kang	Busan National University
2-5 Oral	Liquid Metal Machine Series Triggered Wire Oscillator	Bin Yuan	Chinese Academy of Sciences, China

2-6 Oral	Icephobic performance of flexible micro-/ nano-structured surface	Lei Wang	Chinese Academy of Sciences, China
2-7 Oral	Substrate study for liquid metal wetting behavior in alkaline solution	Liang Hu	Chinese Academy of Sciences
2-8 Oral	Formation of octyltriethoxysilaneself-assembled monolayer on a silica substrate: A kinetic Study	Lalit M. Pandey	Indian Institute of Technology
10:00-10:20	**Coffee Break**		
2-9 Oral	Ohmic contact formation for n+ 4H-SiC substrate by selective heating method using hydrogen radical irradiation	Tetsuji Arai	University of Yamanashi
2-10 Oral	Reduction of dislocation densities of Ge layers grown on Si substrates by using microwave plasma heating and fabrication of high hole mobility MOSFETs on Ge layers	Hiroki Nakaie	University of Yamanashi
2-11 Oral	Resistive Switching in Stabilized Zirconia Films Studied by Conductive Atomic Force Microscopy	Dmitry Filatov	Lobachevsky State University of Nizhny Novgorod
2-12 Oral	Graphene, Silicon Carbide and Silicon thin films deposited by Hot Filament CVD for different device applications.	Pratima Agarwal	Indian Institute of Technology Guwahati
2-13 Oral	Thin films via Pulsed Laser Deposition Technique for Photonics applications	Alika Khare	Indian Institute of Technology Guwahati
2-14 Oral	Co-sputtering Deposition, Optical and Electrical Properties of Cu2O:In and Cu2O:Zn	FAN YE	Shenzhen University

Technical Session 3: Material Series VI

Session Chair: TBD

3rd Floor, Arnoma Grand Bangkok 8:00-12:00, Thursday Morning, January 5, 2016

3-1 Oral	TEM observation of Si0.99C0.01 Thin Films with Arsenic-Ion-, Boron-Ion-, and Silicon-Ion-Implantation followed by Rapid Thermal Annealing	Junji YAMANAKA	University of Yamanashi, Kofu, Japan

3-2 Oral	TEM and STEM Observations of a Flat Continuous Silicon-Germanium Thin Film Epitaxially Grown on Porous Silicon	Junji Yamanaka	University of Yamanashi, Kofu
3-3 Oral	Mg Tilted-Angle Ion Implantation for Threshold Voltage Control and Suppression of the Short Channel Effect in GaN MISFETs	Hayao Kasai	Hosei University
3-4 Oral	Optimizing a Single-Absorption-Layer Thin-Film Solar Cell Model to Achieve 31% Efficiency	Joseph O'Connor	Naval Postgraduate School
3-5 Oral	STEM Moire Observation of Lattice-Relaxed Germanium Grown on Silicon	Junji YAMANAKA	University of Yamanashi
3-6 Oral	Ni-P Alloy Fiber Prepared by Electroless Plating on Pd-activated PAN Fiber Using a Drying Process	Jae-Young Lee	Hydrogen Fuel Cell Center, Woosuk University
3-7 Oral	An analytical description for the elastic compression of face-centered cubic polyhedral nanoparticles	Liang Yang	Xi'an Jiaotong University
3-8 Oral	Surface effect on indentation of soft materials by various indenters	Yue Ding	Xi'an Jiaotong University
3-9 Oral	A universal method to calculate the surface energy density of spherical surface in crystals	Jian Wang	Xi'an Jiaotong University
	Poster Session		
10:00-10:20	**Coffee Break**		
3-10 Poster	Synthesis and Characterization of UV-Curable Biodegradable Hybrid Resin for 3D Printing Surgical Guide	Eunjin Shin	Pusan National University
3-11 Poster	Emulsion RAFT Polymerization for Porous Nanoparticles	Bo-Yun Chang	Pusan National University
3-12 Poster	Synthesis and Characterization of Porous Particles by RAFT Polymerization	Taeyoon Kim	Pusan National University
3-13 Poster	Surface-induced orientation of pentacene molecules and transport anisotropy by scratched method on SiO2 dielectric layer for organic thin film transistor	Yun HoKim	Korea Research Institute of Chemical Technology

3-14 Poster	Modified β-Cyclodextrin with L-Ascorbic Acid for Skin Whitening Agent	EunKyung Yoo	Pusan National University
3-15 Poster	Trace pollutant detection in aqueous solution using magnetic core-shell color sensor	Byunghwan Lee	Keimyung University
3-16 Poster	Surface Resistivity at High Electric Fields for Biobased Polymer Films	Mika KAWAI	Niigata University
3-17 Poster	Catalytic performance of metal azolate frameworks for the solventless synthesis of cyclic carbonates from CO2 and epoxides	Han Ung Kim	Pusan National University

Technical Session 4: Physics Series III

Session Chair: TBD
3rd Floor, Arnoma Grand Bangkok 8:00-12:00, Thursday Morning, January 5, 2016

ID	Paper Title	Author	Affiliation
4-1 Oral	Unification of Gravity and Electromagnetism	Mohammed El-Lakany	Cairo University,Giza,Egypt
4-2 Oral	Design of a compact cycloidal drive for aerospace applications	Naveen p	Manipal University
4-3 Oral	Derivation of Specific Velocity of Body Moving Under Gravity with Zero Total Energy*	V.B.S.S.Murthy Tadepalli	BGR Energy Systems Limited, Chennai
4-4 Oral	About the energy interval beyond the ankle where the cosmic radiation consists only of ultraheavy nuclei from Zinc to the Actinides	Antonio Codino	University of Perugia, Italy and INFN
4-5 Oral	Exotic orbits of asteroids in the solar system and their impacts on space missions	Richard Schwarz	University of Vienna
4-6 Oral	Effect of hole size on flow structure and mixing characteristic in a multi-hole baffled micro combustor	Won Hyun Kim	School of Mechanical Engineering, Kyungpook National University
4-7 Oral	Effect of inlet velocity on the crude oil coking and gas phase formation in a straight pipe	FOUZIA DAHMANI	Mechanical engineering
4-8 Oral	Numerical study of the hydrodynamic performance of two wiggling hydrofoils in diagonal arrangement	Xingjian Lin	The School of Aircraft Engineering, Nanchang Hangkong University
4-9 Oral	Elastic Moduli in Cadmium Selenide doped with Chromium	Vladimir Gudkov	Ural Federal University, Russia
4-10 Oral	Adiabatic Potential Energy Surface of Jahn-Teller Centers in CdSe:Cr2+ Crystal with a Quadratic T⊗(e+t2) Problem	Vladimir Gudkov	Ural Federal University, Russia

Part IV Abstracts

Technical Session 1: Material Series IV

ID: ACM2017_80002
Title: Optimization of in-plane curvilinear bundle placement for 3D printed Carbon fiber reinforced polymer composite with constraint of fibre curvature
Name: YUSUKE YAMANAKA
Affiliation: Graduate school of Tokyo Institute of Technology
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Abstract
3D printing of Carbon fibre reinforced polymer composites (CFRP) using continuous carbon fibers has been developed. The new method enabled us to place curvilinear CFRP bundles in a plane. The curvilinear placement of fibre bundle extends in-plane local orthotropic mechanical properties of the CFRP composites. In the previous pa-per, optimization of in-plane curvilinear carbon fiber placement was conducted using streamline of perfect fluid. The results showed that the stress concentration around a hole was decreased and that increased local strength by selecting appropriate local fiber curvature.
The previous paper, however, did not dealt with constraints of the fibre bundle curva-ture for the 3D printing process In the present paper, therefore, optimization of the curvilinear CFRP bundle placement with the newly developed constraint of fiber cur-vature limit for the actual 3D printing process,
In the present study, Genetic Algorithm (GA) was employed for the optimization tool. The constraint is not embedded into the GA. In the optimization process, the CFRP bundle is placed by means of selecting sets of streamlines as a center line of CFRP bundle. When the selected streamline does not satisfy the curvature constraint, the violated part is removed and Bezier curve is drawn to satisfy the limit. The present method is similar to the repair system of the GA although the method does not repair the genes of the GA. As a result, the CFRP bundle placement that satisfied constraints can be obtained. The result, however, does not exhibit superior strength compared to conventional unidirectional fiber placement. As the constraints used in the present study is too mush conservative, there may be potential of CFRP bundle placement that exhibits higher fracture strength than that of unidirectional one. A brand new fail-ure criteria for the curved CFRP bundles is indispensable for the future work.

ID: ACM2017_80003
Title: Analysis Method using Electric Potential Function for Calculating the Change in Electric Potential Induced by Delamination Cracks in Carbon Fiber Reinforced Polymer Composites
Name: Takuya Yamane
Affiliation: Tokyo Institute of Technology
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Abstract
Delamination cracks causes degradation of compressive strength of carbon-fiber-reinforced polymer (CFRP) composites. Among many researched methods to detect these delamination cracks, a method using electrical resistance changes of CFRP composites attracts attention as a self-sensing method. The self-sensing method does not require additional sensors, and the electrical contact at the surface of the composites is the only required fabrication. The method, however, needs a lot of experimental results or analytical results to obtain the relationship between the delamination crack location and dimension and the electric potential changes. In the present study, a simple analysis method for calculating the change in electric potential induced by delamination cracks is proposed for three-dimensional CFRP structures using newly developed an electric potential function of doublets. The doublets are used to annihilate the electric current flow in the through-thickness direction at the delamination crack surface in the CFRP laminates. The newly developed 3D-doublet analysis method was applied to calculating the change in electric potential of unidirectional CFRP plates. The analysis was conducted for two kinds of plates: the first has one delamination crack, and the other has two. In both cases, electrodes for inflow and outflow of electric current are placed on the opposite surfaces of the plate to form the oblique current flow, which makes those potential changes more sensitive to delamination cracks. The calculated results of the surface electric potential changes are compared with the computed results obtained by the finite element method (FEM). The comparison showed the analyzed potential changes agreed very well with the results of FEM. As the new analysis method gives formulas, the computational cost is extremely small, and the results are quite effective for delamination crack monitoring.

ID: ACM2017_80005
Title: The Strength Characteristics of C/C Composite Material with Opening Hole and Typical Application
Name: Tan Zhiyong
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Email: tanzhy_01@163.com

Abstract
Research on the opening hole and connecting problem of C/C composite material and typical part was conducted. The strength characteristics of plate with opening hole were tested and the applicability of strength criteria focused on particular point was analyzed. Conclusion is obtained that obviously conservative to evaluate open hole and joint strength by hole-edge stress. The extruding strength characteristics of C/C structure with opening hole was tested, different influential parameters were collected and analysed. Based on these, high and normal temperature strength test of typical circular shaft was completed, proving that comprehensive joint performance can be significantly improved by appropriately optimized design.

ID: ACM2017_80006
Title: Magnetic Responsive Soft Composite with Variable Elasticity and Its Application
Name: Tetsu MITSUMATA
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Abstract
Magnetic responsive soft composite that alters the viscoelastic properties in response to the magnetic field has been investigated. The magnetic soft composite consists of magnetic particles and polymer matrix such as polymer gels or elastomers, which is called magnetic elastomer in this study. Typical for MR soft

composites, the diameter of magnetic particles is in several microns. When a magnetic soft composite is put in a magnetic field, the elastic modulus increased. The storage modulus for the magnetic elastomer without magnetic fields (0 mT) was ~104 Pa and it rapidly increased to ~1.5 MPa when a magnetic field of 500 mT was applied. The magnetic elastomer exhibited a reversible increase by factors of 277 of the storage modulus and 96 of the loss modulus upon the magnetic field, which were nearly the same level with magnetic hydrogels demonstrating the giant magnetorheology. This MR effect maintained the magnetic field response for half year after the synthesis. In addition, the magnetic elastomer underwent high mechanical toughness with a breaking strain exceeding 0.8, and did not show a permanent deformation after removing the strain. We have also tried to improve the MR property of magnetic elastomers. A typical example is bimodal magnetic elastomers mimetic to sea cucumber, which consist of magnetic particles (iron) and nonmagnetic particles (ZnO). The relative change in the Young's modulus at 320 mT for the monomodal magnetic elastomer was 1.8 and it was raised to 5.8 only by mixing with the nonmagnetic particles of 9.6 vol%, originating from the stress transfer by the additional chains of magnetic particles via nonmagnetic particles. The MR property of various magnetic soft composites and their recent applications as actuators will be presented.

ID: ACM2017_80008

Title: Preparation Process and Optimization Design for Composites Rudderpost in the Long-time High Temperature Environment

Name: Jing Li
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Abstract
Rudder is an important part for the glider aircraft. In order to satisfy the long-time high-velocity maneuvering for the near-space vehicle in the atmosphere, the light-weight, high-stiffness and high-strenghth all-composites rudderpost is required urgently to be prepared. The all-composites rudderpost can keep high rudder efficiency in the high temperature environment. Based on the technique requirement of high-performance composites rudder, a 3D C/SiC rudderpost was manufactured by the CVI-CMC-SiC processes. It was found during rudderpost testing that the high-temperature mechanical properties decreased and had large discretization. The analysis of the failure mechanisms was conducted by FTA method to recognize the failure modes and main reasons for rudderpost abnormal frature and to reproduce the fracture phenomenon, which could guide production company to modify their preparation process control. Then the modified processes were proved to be validated. And the stability and reliability of the production performances were improved.

ID: ACM2017_80012

Title: Reduced Graphene Oxide/Gold Nanoparticle Aerogel for Catalytic Reduction of 4-Nitrophenol

Name: Xinjiang Cao
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Abstract
Currently, it is of great significance and a challenge to develop facile synthetic routes to obtain a novel plasmonic heterogeneous catalyst with high activity and long lifetime for the reduction of a refractory organic compound like 4-nitrophenol (4-NP). To this end, a three-dimensional (3D) porous

framework named reduced graphene oxide/gold nanoparticle aerogel (rGO/Au NPA) was constructed by individual GO sheets and HAuCl4 under the reduction of trisodium citrate dihydrate (Na3Cit) via a one-step hydrothermal method. The abundant Au NPs having a diameter of 7–160 nm can be easily in situ incorporated into graphene sheets to form a 3D hierarchical monolith by the reduction of Na3Cit, which was well-disclosed by field-emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). Such 3D rGO/Au NPA with interconnected porous structure displays a good thermal stability and large Brunauer−Emmett−Teller specific surface area of 37.8325 m2 g-1. More importantly, the fabricated rGO/Au NPA can act as a heterogeneous catalyst, exhibiting an outstanding catalytic activity and good reusability towards the reduction of 4-NP due to the synergetic effect between Au NPs and graphene sheets. Additionally, the mechanism of enhanced catalytic efficiency for the 3D rGO/Au NPA catalyst has also been proposed.

ID: ACM2017_80013

Title: TiO2-Nb2O5 Nanocomposites: Effect of Surface Morphological Characteristicson Photoactivity and Environmental Applications

Name: Mahendrasingh Pawar

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Abstract

In the past few years, a great deal of attention has been paid towater-treatment technology.Alot ofwater treatment techniquesincluding condensation, ultrafiltration, membraneseparation, and adsorption have been adopted to removepersistent organic compounds and microorganisms in water. Especially, advanced oxidation processes (AOPs),which have the potential to completely mineralize organiccompounds to CO2and H2O, have shown a great potentialas a low-cost and high efficiency water treatment technology. Heterogeneous photocatalysis by semiconductor nanoparticles activated by UV irradiations is a promising technology for water treatment and hence the environmental remediation. The photocatalytic activity of semiconductors is increasingly being used to disinfect water, air, soils, and surfaces. Titania (TiO2) is widely used as a photocatalyst in thin films, powder, and in mixtures with other semiconductors or metals.TiO2 nanoparticles have dominated the field of photocatalysis in terms of research, characterization, and applications.The demand for visible light activated photocatalytic systems is increasing rapidly.

Nb2O5 is the well-known semiconductor and has attracted a great deal of interests due to itsmany remarkable properties suitable for a wide range ofapplications such as for gas sensing, catalysis, electrochromics,photoelectrodes as well as in photo-degradation oforganic contaminants.In this study, TiO2-Nb2O5 nanocomposites were synthesized via two different methods (sol-gel and sol-gel assisted combustion methods) for use as a visible light activated photocatalyst.The effect of synthesis parameters was studied. The TiO2-Nb2O5nanocomposites prepared via sol-gel assisted combustion method were highly crystalline and had smaller crystallite size (~ 9 nm) as compared to the one prepared by sol-gel method (~ 18 nm). The crystal structure, particle size, particle interaction, optical characteristics and photoactivity of TiO2-Nb2O5nanocomposites are discussed in detail. Measurements characterizing the nanocomposites are carried out using XRD, SEM, TEM, EDAX, BET, UV-Vis spectroscopy.The band gap of the synthesized nanocomposites was found to be size

dependent.Photoluminescence study confirms the results obtained by XRD and TEM.The photoactivity of the alloys is carefully studied through methylene blue (MB) degradation experiments, and recommendations are provided for further improvement.

ID: CN2017_80005

Title: Template-free Bipotentiostatic Deposition of Thermoelectric BixTey Nano Arrays

Name: Chuan Zhao

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Abstract

Monodispersed Bi-Te nano arrays are achieved via template-free bipotentiostatic deposition. The diameter and length of individual nanorod is ~80 nm and ~250 nm respectively. The co-deposition process is demonstrated to follow a two-step mechanism: an instantaneous reductive potential is applied to form dispersive nuclei, then a reversal oxidative potential strips partial Bi atoms to prevent further cross-growth. Repeatedly, the nano arrays film is obtained eventually. The thermoelectric properties of the obtained Bi-Te nano arrays such as electrical resistance, carrier density, Seebeck coefficient and power factor are measured to be 2.438×10-4 Ω m, 4.251×1020 cm-3, -25.892 μV K-1, 2.750×10-6 W m-1 Ҡ2, respectively.

ID: CN2017_80013

Title: Experimental study of graphene coated metal meshes as a channel in bipolar plates

Name: Gil Won Lee

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Abstract

Since the machining process to make serpentine channels in bipolar plate is quite ex-pensive, the alternative materials for gas flow-field in bipolar plates have been studied by various researchers. Porous materials as a channel in bipolar plate could enhance the performance of the polymer electrolyte membrane fuel cell (PEMFC) system [1]. As the alternative material of bipolar plate, the metal meshes have been interested with the meaningful mechanical properties such as Young's modulus and robustness, which leaded the similar performance with the type of the conventional serpen-tine-channel in the bipolar plate [2]. However, the metallic ions into membrane elec-trode assembly (MEA) provided the decrease of performance of PEMFC, which con-tains with the several problems as the bipolar plate, e.g. electric contact resistance and corrosion of metal meshes in PEMFC [3].

Nowadays, graphene has much attentions because of its good electrical conductivity and high corrosion resistances [4]. In this study, we coated the Reduced Graphene Ox-ide (RGO) on metal meshes in order to improve the electrical contact resistance (ECR) and the corrosion resistance (CR) from metallic ions. Compared with bare and RGO coated meshes, the ECR of RGO coated meshes showed much lower than it of the bare meshes. In addition, the CR of RGO coated meshes showed dramatically en-hancement. The ECR was proportional with the amount of RGO coatings, which plays a key role of the improvement in ECR and CR of PEMFC. In addition, we found that RGO coating layers could protect the poisoning of MEA from the metallic ions. Finally, the performance of PEMFC with RGO coated meshes showed the excellent improve-ment.

ID: ICBA2017_80002

Title: Mucoadhesive microparticles with nanostructures for prolonged retention in

gastrointestinal tract

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Abstract

Oral drug of poor bioavailability often needs multiple daily administrations to maintain a therapeutically effective level of systemic drug concentration, which is limited in an inconvenient regimen of drug therapy. In this sense, the carriers, which could stay in the gastrointestinal (GI) tract and also release drug in a sustained manner, would be useful. For this, we propose mucoadhesive, nanostructured microparticles as a potential oral-drug carrier in this work. Those functional microparticles herein possessed a high specific surface area originated from their nanostructure, hence improved mucoadhesion through a gastrointestinal (GI) tract. We examined the in vivo retention time of the microparticles in the GI tract after their oral administration in living rats in this study.

ID: ICBA2017_80004

Title: Automated microphysiomer for assessment of cytotoxicity

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Abstract

Cytotoxic properties of new chemicals or drugs have to be assessed before they enter into the market. Here we present an automated method to investigate the interaction of soluble substances with living cells. Living cells are cultivated on a BioChip which measures their cellular respiration, extracellular acidification and changes in impedance online [1]. With an automated fluidic system different concentrations of the substance under investigation can be transported to the cells. This makes it possible to determine the cytotoxic potential of the substance. By removing the substance it is possible to monitor the recovery of the cells and to distinguish between a true toxic effect and an inhibitory effect. Examples from fields as environmental monitoring, eye irritation testing and repeated dose toxicology are presented. An outlook toward the development of organ on chip systems [2] is given.

ID: ICBA2017_80005

Title: Osteogenesis of Bone Marrow Stem Cells on Polycaprolactone/Hyaluronic Acid Hybrid Microspheres

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Abstract

The needs for microspheres made of biodegradable polymers have gradually increased with the developments of bioactive delivery systems, tissue engineering, and regenerative medicine. The microspheres have been prepared by various methods including w/o/w emulsion solvent extraction/evaporation, freezing and lyophilizing, and incorporating gas pocket. Traditional microspheres fabrication methods typically suffer from lack of batch to batch reproducibility, hindering their potential to up-scale and their translation to the clinic. The traditional microspheres also do not have effective stem cell differentiation potentials. Hyaluronic acid is a naturally occurring non-immunogenic glycosaminoglycan and plays a significant role as a facilitator of osteogenic differentiation and as a migration-stimulating agent for mesenchymal stem cells. In this study, polycaprolactone (PCL)/hyaluronic acid (HA) hybrid microspheres were simply prepared by a spray/precipitation method using a double nozzle spray. Size distributions were obtained by controlling gas flow rate and polymer

concentration. Human bone marrow stem cells (BMSCs) were seeded on the prepared PCL/HA microspheres to demonstrate the feasibility of utilizing these microspheres for bone regeneration. From the in vitro osteogenesis using BMSCs, the PCL/HA microspheres showed the effective osteogenesis of bone marrow stem cells compared to the PCL microsphers. From the results, we recognized that the PCL/HA microspheres can be widely applicable as bone fillers for tissue engineering applications.

ID: ICBA2017_80006
Title: Plasmid DNA-Loaded Polycaprolactone Microspheres as Bioactive Bulking Agent for Soft Tissue Augmentation
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Abstract
Soft tissue augmentation is required for the reconstruction of skin tissues in facial deformities, trauma and defects, causing functional troubles or esthetic complaints. Several techniques for managing such deformities have been proposed for the soft tissue regeneration. Recently, the injec-tion for soft tissue augmentation has gained popularity because of its initial low cost, minimal inva-siveness, and low morbidity as compared to surgical plastic surgery methods. A number of injectable substances have been adapted in the clinical practice, however, relatively short-term volume stability (by migration and resorption), inflammation, granuloma formation, and tissue necrosis are considered as limitations for practical use. In this study, we prepared plasmid DNA (encoding for bFGF) complex–loaded alginate/hyaluronic acid (HA) hydrogel dispersed with polycaprolactone (PCL) microspheres, as an injectable bulking agent for the soft tissue augmentation. For effective transfection of plasmid DNA into stem cells, the plasmid DNA was condensed by polyethylene-imine-polyethylene glycol (PEI-PEG). The pDNA complex was continuously released from the hy-drogel for more than 30 days. We investigated the transfection efficiency of pDNA complex into adipose-derived stem cells (ADSCs) and its cytotoxicity, bFGF expression from the gene-transfected cells, and the proliferation/differentiation behavior. From the in vivo animal study, the pDNA complex-loaded bulking agent group showed faster soft tissue augmentation behavior than the groups without pDNA complex. From the results, we expected that the pDNA com-plex-loaded bulking agent system may be a good system for the effective soft tissue regeneration as well as passive bulking effect.

ID: ICBA2017_80007
Title: Plasmid DNA Complex-Loaded Asymmetrically Porous membrane
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Abstract
We prepared plasmid DNA (with BMP-2 encoding) complex-loaded polycaprolactone (PCL)/Pluronic F127 membrane to enhance the osteogenic differentiation of adipose stem cells (ASCs). It is well known that the BMP-2 is a master transcription factor for osteogenesis. The pDNA/PEI-PEG complex-loaded PCL/F127 membranes were fabricated by an immersion precipitation method developed by our laboratory. The in vitro characterizations of the membrane to evaluate its potential use as a gene delivery system for osteogenesis were conducted. The release behavior of the pDNA complex and cytotoxicity/cell transfection efficiency by the

pDNA complex released from the membrane, and the BMP-2 expression from the transfected cells were investigated. The pDNA complexes were efficiently loaded into the membrane (> 80% of initial loading amount) and continuously released from the membrane for a long period of time (more than 3 months). From the in vitro transfection assays, it was observed that the pDNA complex released from the membrane was efficiently transfected into the ASCs, inducing the ASCs to secrete BMP-2, increase calcium deposition, gene expressions of alkaline phosphatase (ALP), runt-related transcription factor 2 (RUNX2) and type I collagen (COLL I), and finally inducing the ASC differentiation into osteoblasts effectively. From the in vivo animal study using rats, pDNA complex-loaded PCL/F127 membranes showed faster bone regeneration than the control (blank) and PCL/Pluronic F127 membrane without plasmid DNA. From the results, we could suggest that the pDNA complex-loaded PCL/F127 membrane can be a good candidate as a gene delivery system for the osteogenesis of ASCs and bone regeneration, owing to their high gene transfection efficiency and low toxicity as well as long-term delivery of BMP-2.

ID: ICBA2017_80008

Title: Dual Hepatocyte Growth Factor/Collagen Type IV-Loaded Asymmetrically Porous Matrix for Tracheal Reconstruction

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Abstract

Reconstruction of the damaged trachea caused by tracheal stenosis, congenital disorders, and prolonged endotracheal intubation is one of the most difficult procedures in otolaryngology surgery. The main reasons of the failure of tracheal defect reconstruction were strongly related to airway stenosis, airway collapse, and mucus impaction. For more effective trachea reconstruction, artificial trachea transplantation made of polymer matrices has been clinically used. However, the slow epithelial regeneration in lumen is considered as one of the crucial huddles for clinical application. Because cilia in the tracheal epithelial are an important protective mechanism of the body and work to trap inhaled foreign particles, preventing from becoming lodged in the lungs. In this study, we prepared an asymmetrically porous matrix with bioactive molecules [hepatocyte growth factor and collagen type IV] for trachea tissue regeneration with an epithelial cell layer in lumen. The morphologies of the asymmetrically porous matrix, release behaviors of bioactive molecules from the matrix, and proliferation/migration/differentiation behaviors of human bronchial epithelial cells on the matrix were investigated. The tracheal reconstruction potential was also investigated using the bioactive molecules-loaded asymmetrically porous matrix in a rabbit model in this study.

Technical Session 2: Material Series V

ID: ICBA2017_80011

Title: A new Method for the Selection and Enrichment of Cancer Stem Cells by cotton fiber

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Abstract
Aims: Isolation and expansion of cancer stem cells (CSCs) plays main role in better understanding of cancer biology as the cancer is maintained by these few cancer cells with stem cell properties. The conventional methods present to improve the isolation of CSCs are unreliable or lower-producing. A hamper in the development of an effective method to enrich CSCs may create some substantial gaps in the advancement of an effectual therapeutic strategy in the field of cancer biology.
Methods: we first obtained PC12 cell spheres with conventional method and carefully characterized them as CSCs.Then we further developed a new, simple method for selecting and expanding CSCs. In the system, PC12 cells were cultured on a supporting material of cotton fibers treated by NH3 plasma.This readily allowed the CSCs to grow into individual round colonies.
Results: Our reports from various experiments such as expression of surface receptor markers, drug resistance ability, gene and protein expression, spheroid colony formation and in-vivo tumorigenicity supports that the cotton fiber dramatically promotes the proliferation and enrichment of cells possessing hallmarks of CSCs.
Conclusion: our study strongly indicates that the cotton fiber scaffolds will facilitate the study of CSC biology and provide a new suitable in-vitro model for the discovery of more efficacious anti-cancer therapies.

ID: ICBA2017_80012
Title: In vivo target bio-imaging of Alzheimer's disease by fluorescent zinc oxide nanoclusters

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Abstract
Alzheimer's disease (AD), the most common cause of dementia, is a progressive and age-related irreversible neurodegenerative disease. It is reported that AD could affect one in nine people over the age of 65 years, with the acceleration of the aging population, this figure is sure to rise dramatically. Therefore, Alzheimer's disease has become one of the major diseases to harm the health of the aged. When Alzheimer's disease occurs, the level of zinc ions in brain changes, and the relevant amount of zinc ions continue decreasing in cerebrospinal fluid and plasma of Alzheimer's patients with the disease exacerbations. In view of these considerations, we have explored a new strategy of in vivo rapid fluorescence imaging of Alzheimer's disease through target bio-labeling of zinc oxide nanoclusters which was biosynthesized in vivo in the Alzheimer's brain via intravenous injection of 0.3 mL 5 mmol/L zinc gluconate solution, which is an ideal organic zinc supplements with good biological compatibility and high bioavailability.. By using the three-month-old and six-month-old Alzheimer's model mice as models, our observations demonstrate that biocompatible zinc ions could pass through the blood-brain barrier of the Alzheimer's disease mice and generate fluorescent zinc oxide nanoclusters (ZnO NCs) through biosynthesis, and then the bio-synthesized ZnO NCs could readily accumulate in situ on the hippocampus specific region for in vivo fluorescent labeling of the affected sites. This study provides a new way for the rapid diagnosis of Alzheimer's disease and may have promising prospects in effective diagnose of Alzheimer's disease.

chemosensory applications.

ID: PMS2017_80002
Title: A Highly Sensitive Diketopyrrolopyrrole-Substituted Polyfluorene as Colorimetric and Turn-Off Fluorimetric Sensor toward Fe3+ and F- Sensing
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Abstract
We report the bifunctional responsive fluorescence chemosensory phenomena of a diketopyrrolopyrrole (DPP)-functionalized conjugated polymer (PFDPP), which was exposed to cation and anions through Suzuki coupling polymerization. The absorption band of PFDPP (i.e., 489 nm) was red-shifted by approximately 109 nm relative to poly(9,9-dihexylfluorene) (380 nm) in THF solution. This red-shift was attributed to the electronic transitions in PFDPP that involved the migration of electron density from fluorene donor groups towards the DPP acceptor, resulting in the observed intramolecular charge transfer interactions and bathochromic shifts. Fluoride ion was induced as quencher to interrupt electronic energy transfer by strong deprotonated interaction. Deprotonation of the N–H groups on PFDPP provided rapid and selective detection of F- in which an apparent color change from yellow to blue with large red shift in ambient light can be observed by the naked-eye and UV light irradia-tion. Photoluminescence titrations demonstrated that PFDPP exhibited high sensitivity towards Fe3+ and F- ion, with Stern-Volmer constants (Ksvs) of 1.58 × 104 M-1 and 1.07 × 103 M-1, respectively. The detection limit (LOD) towards Fe3+ and F- ion was as low as 4.90 × 10-6 M and 1.34 × 10-5 M, respectively. Our results suggest that PFDPP is a promising material for

ID: PMS2017_80003
Title: Synthesis of Biodegradable Nanoparticles Based on Polyfumarateurethane for DNA Delivery
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Abstract
Biodegradable polyfumarateurethane (PFU) for delivery vehicle using di-(2-hydroxypropyl fumarate (DHPF), PEG (polyethylene glycol) and HDI (1.6-diisocyanatohexane) was designed to be degraded through hydrolysis and enzymatic mechanisms due to its ester bond in polymer backbond. Using water-in-oil-in-water emulsion, nanoparticles encapsulating complexes of DNA and linear polyethylenimine (LPEI) or bovine serum albumin labeled with fluorescein were fabricated. The nanoparticles have PEG on their surfaces which helps nanoparticles to avoid the immune system. The characteristics of these nanoparticles were confirmed by TEM, DLS, cellular viability and confocal microscopy.

ID: SIM2017_80000
Title: Liquid Metal Machine Series Triggered Wire Oscillator
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Abstract
Gallium based liquid metal opens a new platform in chip cooling, flexible circuits, shape transformable material and more due to it unique properties such as high electrical

conductity, excellent fluidity and low melting point. Recently, we found that adding aluminum to liquid metal would lead to long distance self-actuation performance in alkaline solution due to surface tension gradient and hydrogen bubbles propulsion. What's more, such liquid metal machine could trigger a copper wire to reciprocally move back and forth across the liquid metal body. When contacting a copper wire to the liquid metal machine, it will be wetted and swallowed and then oscillates horizontally like a violin bow. In addition, bent copper wire could also oscillate in liquid metal machine series. Such oscillation pheonmenon could be explained by the wetting force difference induced by chemical reaction. The contacting region of copper wire and liquid metal contains alkaline solution due to surface roughness induced by aluminun granules adhesion on copper wire. Chemical reaction between aluminum and alkaline solution generates large amounts of hydrogen, which reduces the wetting force between liquid metal and copper wire. The imbalance of wetting force on the two edges leads to oscillating phenomenon continuously. Given appropriate designing, such autonomous oscillator composed of hybrid solid and liquid metal structures can be developed as a core switch element in periodically regulating devices to realize various fluidic, electrical, mechanical and optical functions. The present finding refreshes the basic understanding of the soft machines commonly conceived in textbook as well as adds new knowledge to the wetting science. It also opens a basic way to fabricate self-powered wire oscillator using liquid metal as the main machine body.

ID: SIM2017_80001

Title: Icephobic performance of flexible micro-/ nano-structured surface

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Abstract

We present a flexible superhydrophobic surface with hierarchical structures composed of composite materials, i.e., Polydimethylsiloxane (PDMS) and zinc oxide nano-rods. The surface has characteristics of water and ice repellency in low temperature (e.g., □ 20℃) and relatively humidity of 90% for more than three years. The mechanism is attributed to the integrative effect of composite flexibility and multi-structures composed of the PDMS micro-papillae and ZnO nano-hairs structures. The ZnO nanohairs serve for repellency of the water droplet, the PDMS micro-structures covered with nano-hairs are responsible for suspending–up of droplet resulted from the coalescence of tiny water condensed droplets or the impact droplets. Meanwhile, the flexibility of micro-structures effectively protect the nano-structures in the impacting and freezing processes, e.g., the nanohairs could not be damaged even with the force of 220 μN under the deformation of 3000 μm, which is also the key factor to remain the excellent superhydrophobicity in low temperature for long time. This finding will offer a novel insight to the micro- and nano-structured surface, which will be helpful to design smart non-wetting materials adapted to the low-temperature environment for development of anti-icing engineering in system.

ID: SIM2017_80004

Title: Substrate study for liquid metal wetting behavior in alkaline solution

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Abstract
Liquid metals such as eutectic Gallium-Indium and Gallium-Indium-tin are quickly emerging as very important functional liquid-state metal materials with many unique properties, which have attracted wide attentions especially the soft robot in liquid. However, the locomotion of liquid metal droplet can be significantly affected by the interaction with surrounding liquids as well as the moving substrates. Thus the wetting behavior of liquid metal on different substrate may play an important role in droplet locomotion in liquid. In our study, the wetting behaviors of liquid droplet on various substrates including insulated, non-metal and metal conductive substrates were examined. The contact angles of liquid droplets on various substrates presented obvious difference. To investigate the underlying mechanism, physical and electrochemical properties of the liquid metal and substrate interaction was examined. The results revealed that the surface potential of substrate in the electrolyte has crucial effects on the electrochemical states of liquid metals droplet, which altered the surface tension of droplet as a results. With different surface tension, the locomotion of droplet on different substrates was also revealed. The physical and electrochemical properties presented in this study provide fundamental knowledge for further soft robot design.

ID: SIM2017_80013
Title: Formation of octyltriethoxysilaneself-assembled monolayer on a silica substrate: A kinetic Study
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Abstract
Silanization is becoming one of the most widely used functionalizationtechniques for modifying silica surfaces with free chemical groupsvia self-assembled monolayers (SAMs). We performed kinetic studies of the chemical modification for synthesizing a hydrophobic silica surface. SAM using a short chain triethoxyoctylsilane (TEOS) was formed under inert atmosphere and analyzed using Fourier transmission infrared (FTIR) spectroscopy, water contact angle (WCA) and atomic force microscopy (AFM). Kinetic fitting of IR data of SAM using Exponential Association function in the range 900-1200 and 2850-3000 cm−1confirmed surface modification and re-orientation of the attached molecules.Fast surface coverage within 16 min was observed whereas re-orientation of attached molecules was slow and continued till 512 min. Lying-down to standing-upmolecular orientation was confirmed by contact angle analysis. AFM images initially showed small islands of ~20 nm, which in-fill with time indicating formation of a smooth monolayer. Our findings indicate that formation of octyl SAMis fast process and completeswithin 8.5 h in contrary to reported 24 h in conventional SAM formation protocols. The kinetic fitting data can be explored to design a nanopatterned surface for a specific application.

ID: TFTA2017_80000
Title: Ohmic contact formation for n+ 4H-SiC substrate by selective heating method using hydrogen radical irradiation
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Abstract
We developed an apparatus for producing high-density hydrogen plasma. We con-firmed that the temperatures of transition-metal films increased to above 800 ℃ within 5 s when they were exposed to hydrogen plasma formed using the apparatus. We applied this phenomenon to the selective heat treatment of W/Ni films deposited on n+4H-SiC wafers and formed nickel silicide electrodes. To utilize this method, we can perform the nickel silicidation process without heating the other areas such as channel regions and improve the reliability.

ID: TFTA2017_80001
Title: Reduction of dislocation densities of Ge layers grown on Si substrates by using microwave plasma heating and fabrication of high hole mobility MOSFETs on Ge layers
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Abstract
We have developed a microwave plasma heating technique to rapidly heat the transi-tion metal. W/SiO2 layers were deposited on Ge/Si heterostructures. By heating the W, dislocations in Ge layers originated from lattice mismatch between Ge and Si crystals were reduced drastically. We have fabricated p-MOSFETs on Ge/Si substrates and realized higher mobility of about 380 cm2/Vs than that of Si p-MOSFET.

ID: TFTA2017_80002
Title: Resistive Switching in Stabilized Zirconia Films Studied by Conductive Atomic Force Microscopy
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Abstract
We have applied Conductive Atomic Force Microscopy (CAFM) to study the micro-scopic mechanism of resistive switching in the ultrathin (3-5 nm) yttria stabilized zir-conia (YSZ) films. Using CAFM, we were able to trace the growth of the individual conductive filaments, which are considered now to be responsible for the resistive switching effect in the transition metal oxides. The growth of the filaments has been proven to be initiated by the defects in the film material including the ones, which are the concentrators of the electric field, in particular, by the roughness (hillocks) of the film/substrate interface. The electron transport via individual filaments has been stud-ied. Besides the butterfly-type hysteresis in the current-voltage (I—V) curves of the probe-to-sample contact typical for the bipolar resistive switching, we have observed the I—V curves with resonant peaks attributed to the resonant electron tunneling via the localized electron states in the filaments.

ID: TFTA2017_80003
Title: Graphene, Silicon Carbide and Silicon thin films deposited by Hot Filament CVD for different device applications.
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Abstract

Thin films of Group IV elements and their compounds such as Silicon, Carbon and silicon carbide offer a wide range of applications because of their tunable opto-electronic, dielectric, and mechanical properties, which are achieved by controlling their microstructure, bonding configuration and stacking sequence. In case of carbon, diversity in different hybridized states of carbon results in number of allotropes such as graphene, graphite, diamond like carbon (DLC), carbon nanotubes and carbon nanoflakes (CNF) etc, whereas in case of SiC, change in stacking sequence results in hexagonal or cubic SiC films. In case of Silicon, changes in microstructure results in the amorphous Si:H, nanocrystalline silicon and polymorphous Silicon films.

Deposition of high quality thin films with large area uniformity is important for fabricating devices. The Hot filament CVD technique has emerged as a fast growing technique with control of uniformity and quality of thin films. We have used this technique to deposit a number of thin films including single and bi layer graphene, DLC, CNF, cubic and hexagonal SiC and amorphous and nanocrystalline silicon thin films at a fast rate and much lower substrate temperature using the source gases Methane, Silane and Hydrogen. Single and bi-layer graphene films were deposited at a substrate temperature of 700oC, whereas DLC and CNF are deposited at a temperature of 400oC by tuning the gas flow rates and chamber pressure. Similarly, highly crystalline cubic SiC films could be deposited at a high deposition rate at a substrate temperature of 550oC. The amorphous and nanocrystalline silicon films could be deposited at a substrate temperature as low as 150oC.

The role of different deposition parameters on the growth, optolectronic and mechanical properties and bonding configuration of these films will be discussed in detail during the presentation.

ID: TFTA2017_80005

Title: Thin films via Pulsed Laser Deposition Technique for Photonics applications

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Abstract

The present day demand for the miniaturized electronics and photonics relies on the precise fabrication of nano-micro structures in the form of thin film geometry. Pulsed Laser Deposition (PLD) technique is among one which has been applied successfully, recently, for synthesis of varieties of thin films for Photonics applications. In this technique, a high power laser (e.g. Q switched Nd:YAG laser or Excimer laser) is focused on a suitable target, resulting into ablation and laser induced plasma formation of the target material. This plasma expands in vacuum or in the presence of suitable gaseous ambient, depending on the requirement, and can be deposited on the substrate placed few cm apart from the target. Thus the technique is conceptually very simple and single system can cater all kinds of films. There is no restriction on the choice of target as well as substrate. The properties of the thin films can be easily tuned by controlling the deposition parameters. The limitation of uniform growth of the thin film over large area via PLD can be overcome by either scanning the laser beam or translating the substrate suitably or both.

The multi composite thin films of oxide, nitride, carbide etc. can be easily fabricated via PLD technique either using the pellet of respective material as target or using the individual multi targets in presence of a

suitable gas. PLD thin films have been tested for wide variety of applications viz; UV emitter and detector, mirror, nonlinear optics, waveguides, optical delay, Optical limiting, photonics sensors etc..

In the present talk, some of the pure metallic and oxide thin films for photonics applications grown via PLD shall be discussed.

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ID: TFTA2017_80006

Title: Co-sputtering Deposition, Optical and Electrical Properties of Cu2O:In and Cu2O:Zn

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Abstract

Cuprous oxide (Cu2O) has many advantages. These advantages include a direct band gap (the forbidden band gap is 2.1 eV), Earth-abundance, no toxicity, low cost and high absorption coefficients, etc. Because of these advantages, cuprous oxide has the potential to be used in solar cells. However, experimental works show that the maximum efficiency of Cu2O pn homojunction solar cells is less than 2%, though the theoretical prediction is 20%. The reason is that the n-type layers in these homojunctions are not real n-type layers. The n-type layers in the homojunctions in the literature were all fabricated with electrodeposition. Electrodeposition can result in the accumulation of Cu2+ ions on the surface. The Cu2+ ions make the layers to behave like n-type conduction, though the layers were actually of p-type. To realize the n-type conduction, we tried doping Cu2O with indium or zinc by reactive co-sputtering deposition. The substrates were K9 glass and the gases were Ar and O2. For pre-paring indium-doped Cu2O thin films, the two targets were circular copper and indium disks, while for preparing zinc-doped Cu2O, the indium target with replaced with a zinc target. Pure-phase Cu2O doped with indium or zinc can be fabricated if suitable sputtering power and gas flow rates, etc. were used. The results show that the indium-doped Cu2O thin films are of n-type conduction below 400K. All zinc-doped samples are still of p-type conduction. The possible mechanism is discussed.

Technical Session 3: Material Series VI

ID: TFTA2017_80007

Title: TEM observation of Si0.99C0.01 Thin Films with Arsenic-Ion-, Boron-Ion-, and Silicon-Ion-Implantation followed by Rapid Thermal Annealing

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Abstract
Strained Si and its related materials, such as strained SiGe and strained silicon-carbon alloy (Si-C), are receiving tremendous interest due to their high carrier mobility. In this study we carry out a basic investigation of the change in microstructure of ion-implanted Si-C solid solution caused by rapid thermal annealing, because it is very important to realize a field-effect transistor made of this new material. We observed the microstructures of arsenic-ion-, boron-ion-, and silicon-ion- implanted Si0.99C0.01 specimens upon thermal annealing by transmission electron microscopy, and it was revealed that the rate of solid-state crystallization of ion-implanted Si-C is slower than that of the ion-implanted Si.

ID: TFTA2017_80008
Title: TEM and STEM Observations of a Flat Continuous Silicon-Germanium Thin Film Epitaxially Grown on Porous Silicon
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Abstract
Strain-relaxed SiGe is an attractive material for use as a substrate of strained Si, in which carrier mobility is higher than that of bulk Si. The concept of this study is the use of porous Si as a sponge like substrate so that a SiGe lattice can relax without in-troducing dislocations. We produced porous Si specimens by electrochemical anodiza-tion and annealed them under a H2 atmosphere. Then, SiGe thin films were grown by gas-source molecular beam epitaxy. We observed the microstructure of the specimens using transmission electron microscopy. The result showed that we succeeded in pro-ducing a single-crystal continuous Si0.73Ge0.27 film with a 10% relaxation ratio and a low dislocation density on porous Si.

ID: TFTA2017_80011
Title: Mg Tilted-Angle Ion Implantation for Threshold Voltage Control and Suppression of the Short Channel Effect in GaN MISFETs
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Abstract
This paper demonstrates that threshold voltages of GaN MISFET are controllable by varying the Mg ion doses for Mg ion implantation. Furthermore, it demonstrates for the first time that the short channel effect can be suppressed using a halo structure that has a p-layer in channel regions adjacent to source/drain regions using tilt ion implan-tation. A device with a Mg dose of 8 × 1013/cm2 achieved maximum drain current of 240 mA/mm and a transconductance of 40 mS/mm. These results indicate a definite potential for the use of our new process in GaN MISFETs for applications in power switching devices.

ID: TFTA2017_80012
Title: Optimizing a Single-Absorption-Layer Thin-Film Solar Cell Model to Achieve 31% Efficiency
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Abstract
This research builds upon the authors' previous work that introduced and modeled a novel Gallium-Arsenide, Emitter-less,

Back-surface Alternating Contact (GaAs-EBAC) thin-film solar cell to achieve >30% power conversion efficiency. Key design parameters are optimized under an Air-Mass (AM) 1.5 spectrum to improve performance and approach the 33.5% theoretical efficiency limit. A second optimization is performed under an AM0 spectrum to examine the cell's potential for space applica-tions. This research demonstrates the feasibility and potential of a new thin-film solar cell design for terrestrial and space applications. Results suggest that the straight-forward design may be an inexpensive alternative to multi-junction solar cells.

[1] J. O'Connor and S. Michael (2016) A Novel, Single-Junction Solar Cell Design to Achieve Power Conversion Efficiency Above 30 Percent. Materials Sciences and Applications, in Press.

ID: TFTA2017_80014

Title: STEM Moire Observation of Lattice-Relaxed Germanium Grown on Silicon

Name: Junji YAMANAKA
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Abstract

We deposited Ge films on Si substrates by molecular beam epitaxy (MBE) method. The specimens were annealed at around 750C using microwave-plasma heating technique which we had reported before. After these processes, we carried out special scanning transmission electron microscopic (STEM) observation. The moiré between the crystal lattices and the scanning lines controlled by STEM was utilized to show lattice-spacing distribution. The results exhibited that we were succeeded in forming lattice-relaxed Ge thin films. It was also recognized that this STEM moiré technique is very useful to observe lattice-spacing distribution for large area with high resolution.

ID: ACM2017_80014

Title: Ni-P Alloy Fiber Prepared by Electroless Plating on Pd-activated PAN Fiber Using a Drying Process

Name: Jae-Young Lee
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Abstract

Micro-sized Ni-P alloy tube was fabricated by electroless plating on polyacrylonitrile (PAN) fiber with μm sized diameter as a template. PAN fiber was loaded with Pd nanoparticles using a drying process and Ni-P alloy was deposited on the Pd nanopar-ticles loaded on PAN surface in an electroless Ni plating solution, and finally PAN fiber was thermally decomposed resulting micro-sized Ni-P alloy tube. The tube was observed by scanning electron microscopy (SEM) and elemental analysis via energy dispersive spectroscopy (EDS) analysis confirmed that the micro-sized tube was composited with Ni : P = 94.3 : 5.7 atomic %.

ID: CN2017_80012

Title: An analytical description for the elastic compression of face-centered cubic polyhedral nanoparticles

Name: Liang Yang
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Abstract

Face-centered cubic nanoparticles display various shapes due to controlled synthesis, which presents a challenge to characterize their elastic response. In the present paper, the elastic response of truncated octahedral

nanoparticles under uniaxial compression is investigated. Through finite element method calculations, an analytical expression of load is obtained for octahedral particles, which is linearly proportional to indent depth, instead of the 3/2 power law relation predicted by Hertzian model for elastic sphere. Comparisons with molecular dynamics simulations demonstrate that the obtained explicit relation can predict the elastic response of polyhedral nanoparticles. This study is helpful to measure the elastic properties of polyhedral nanoparticles, and characterize their elastic response.

ID: SIM2017_80010
Title: Surface effect on indentation of soft materials by various indenters
Name: Yue Ding
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Abstract
Surface energy and hyperelasticity have significant influences on the mechanical response of soft materials like polymers and biological tissues in indentation experiments. In this paper, conical, flat and spherical indentations on hyperelastic materials with surface energy are investigated. The neo-Hookean model is used to characterize the hyperelastic behavior of soft solids, and the influence of surface energy is analyzed through finite element simulations. For the three typical indentions, the explicit relations between compressive load and indent depth are obtained considering both finite deformation and surface energy. When the contact radius is comparable with the ratio of surface energy density to elastic modulus, surface energy will evidently alter the contact pressure, surface profile, and overall response. Compared to the linear elastic predictions, the neo-Hookean hyperelasticity tends to increase the indent depth, while surface energy has a reverse effect. The obtained results are helpful to accurately characterize the mechanical response of soft solids via indentation tests.

ID: SIM2017_80011
Title: A universal method to calculate the surface energy density of spherical surface in crystals
Name: Jian Wang
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Abstract
Surface energy plays an important role in the mechanical performance of nanomaterials, however determining surface energy density of curved surfaces still keeps a challenge. In present paper, we conduct atomic simulations to calculate the surface energy density of spherical surfaces in various crystalline metals. It is found that the average surface energy density of spherical surfaces keeps almost constant once its radius is larger than 5 nm. Then using a geometrical analysis and the scaling law, we develop an analytical approach to estimate the surface energy density of spherical surfaces through those of planar surfaces. The theoretical prediction agrees well with the direct atomic simulations, and thus provides a simple and general method to calculate the surface energy density in crystals.

ID: PMS2017_80007
Title: Synthesis and Characterization of UV-Curable Biodegradable Hybrid Resin for 3D Printing Surgical Guide
Name: Eunjin Shin
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Abstract

Nowadays, photocurable resin for 3D printing is used in various field. Resins for surgical guide need strong compressive strength, wide range of workable temperature, small shrinkage and biodegradable properties. In order to get better chemical and mechanical properties, polycaprolactone, aliphatic polyester, was used to synthesize photocurable 3D printable oligomers with methacryloyl chloride, and hibridized with silica nanoparticles, which was surface modified with 3-(trimethoxysilyl) propyl methacrylate (MPS). Polycaprolactone trimethacrylate (PCLTMA) was analyzed with IR and GPC. To evaluate compressive strength by UTM, PCLTMA/silica hybird was crosslinked with ultraviolet light using camphorquinone as an initiator and N,N'-(dimethylamino)ethyl methacrylate as an activator.

ID: PMS2017_80006
Title: Emulsion RAFT Polymerization for Porous Nanoparticles
Name: Bo-Yun Chang
Affiliation: Pusan National University
Email: cby@pusan.ac.kr

Abstract
Porous polystyrene (PS) particles were synthesized through surfactant-free emulsion polymerization in the ab initio batch condition based on RAFT (reversible addition-fragmentation chain transfer) polymerization. Water-soluble amphiphilic RAFT agent was synthesized from poly(ethylene glycol) methyl ether and 2-(dodecylthiocarbonothioylthio)-2-methylpropionic acid (DDMAT). Styrene was copolymerized with methyl vinyl ketone (MVK) using ACPA as an initiator, followed by the photodegradation by UV irradiation. PS particles were characterized with FT-IR (Fourier transform infrared), 1H-NMR spectroscopies. GPC and DLS confirmed the narrow polydispersities and the formation of narrow-distributed particles. Porous surface and morphology of particles were confirmed by SEM and TEM images. Porous PS particles are expected to be used in drug delivery system and future biomaterials.

ID: PMS2017_80005
Title: Synthesis and Characterization of Porous Particles by RAFT Polymerization
Name: Taeyoon Kim
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Abstract
Interesting of polymer capsules are increasing in various fields, including synthetic chemistry, biotechnology, pharmaceutics, and diagnostics, catalysis. Currently, there is an increased focus on the synthesis and examination of nanoporous materials. Porous, hollow, and polymeric nanoparticles using colloidal silica (CS) as a template were prepared by initially coating silica with 3-methacryloxypropyltrimethoxysilane (MPS) and forming a shell by the polymerization of a mixture of styrene, methyl vinyl ketone (MVK) and divinylbenzene (DVB). After silica core was removed by etching with hydrofluoric acid, the remaining polymeric shell was then become porous structures by photodegrading poly(MVK) component in the nanoparticles with ultraviolet (UV) irradiation. The porous, polymeric shell was characterized by 13C NMR and FT-IR spectroscopies. The morphology and the size distribution were determined with FE-SEM, TEM, and DLS, respectively.

ID: PMS2017_80001
Title: Surface-induced orientation of pentacene molecules and transport

anisotropy by scratched method on SiO2 dielectric layer for organic thin film transistor

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Abstract
We obtained preferential in-plane molecular orientation and charge-transport anisotro-py in pentacene thin-film transistors (TFTs) on conventional SiO2/Si substrates. The nanoscale SiO2 grooves with depths of 1–3 nm were prepared by a simple scratching process with diamond powder to create a new type of alignment template for inducing the aligned growth of pentacene with in-plane anisotropy. Results of atomic force mi-croscopy and grazing-incidence X-ray diffraction showed that the nanogrooved SiO2 structure could control the alignment and growth mode of pentacene, and it remarkably decreased the grain size of the pentacene crystals. The charge-carrier mobility along the parallel axis of the nanogrooved structure (0.392 ± 0.039 cm2/(V•s)) was more than four-fold higher than that perpendicular to the alignment (0.104 ± 0.048 cm2/(V•s)). In addition, we investigated the effect of nanogrooved SiO2's surface roughness on the electrical properties of the pentacene TFT, which proved to be a crucial factor when compared to the preferential alignment of the pentacene molecule.

ID: ICBA2017_80003

Title: Modified β-Cyclodextrin with L-Ascorbic Acid for Skin Whitening Agent

Name: EunKyung Yoo
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Abstract
L-Ascorbic acid (AA) is one of the interesting and well known acids in nature which is used in cosmetic, pharmaceutical, and food industry due to its bioactivity and antioxidation. But the bioavailability of AA decreases with time because it is spontaneously oxidized in the presence of oxygen. Cyclodextrin (CD) which has hydrophobic inside and hydrophilic outside, can encapsulate various organic/inorganic molecules to form inclusion complex with hydrophobic compounds. Thus they can enhance the solubility and chemical stability of such compounds in aqueous solution, and finally increase the bioavailability. This study aimed to prepare the novel skin whitening agent including CD, which has better properties in skin permeation, whitening efficiency and duration time than existing product. AA was covalently bonded to β-CD using succinic anhydride (SAH) as a linkage, and was characterized through FT-IR, NMR, DSC, TGA, respectively.

ID: CN2017_80003

Title: Trace pollutant detection in aqueous solution using magnetic core-shell color sensor

Name: Byunghwan Lee
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Abstract
More than 100,000 kinds of synthetic chemicals are used in various applications of domestic industry and agriculture. These trace pollutants generated from the chemicals are attracting growing attention due to the impact on the environment and human health. Demands for detecting and reducing trace pollutants in fast and cheap way are increasing dramatically. In this work,

core-shell materials were prepared for the detection and removal of bisphenol A and mercury ions in aqueous solution. Core-shell structure is useful because it has two or more properties by the core material and the shell material. Magnetic core material (Fe3O4) was used to improve the collection rate of the materials from aqueous solution. Magnetite is inexpensive and can be prepared by simple procedure. Polymer shell material could adsorb and remove pollutants. N719 dye was used for color sensing of mercury ion in aqueous solution. We also used graphene oxide and gold nano particles as shell materials. Because graphene oxide has many functional groups, it has some advantages for the detection of trace pollutants. Gold nanoparticle is both chemically stable and excellent in selective adsorption for target compounds through surface functionalization. For the characterizations of the prepared materials, we used magnetic properties measurement system, FTIR, XRD, SEM, and TEM.

ID: ACM2017_80007
Title: Surface Resistivity at High Electric Fields for Biobased Polymer Films
Name: Mika KAWAI
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Abstract
We have investigated the surface electric resistivity for biobased polymer films at high electric fields. The development of high-performance biobased polymers such as polyimides (PIs) or polyureas is indispensable to establish a sustainable green society, but it is very difficult due to the incompatibility of their monomeric aromatic diamines with microorganisms. One of coauthors (T.K.) has developed biobased PIs from bioavailable aromatic diamines, which were photodimers of 4-aminocinnamic acid (4ACA) derived from genetically manipulated Escherichia coli. These biobased PI films showed ultrahigh thermal resistance with T10 values over 425 ℃ and no Tg values under 350 ℃, which is the highest value of all biobased plastics reported thus far. This advanced thermal property can be useful for electric devices which have both high electric conductivity by metal deposition and super insulating properties. In this paper, we present the electric resistance for biobased PI or polyurea films with various chemical structures, and discuss the relationship between the dielectric breakdown behavior and the chemical structure. The electric resistance measurement was carried out at room temperature using two terminals method with an ultrahigh resistance meter. The surface resistivity showed a constant value at electric potentials from 25 V to 1 kV for both films, and the biopolyimide film demonstrated a high resistivity comparable with KaptonTM films. The relationship between the surface electric resistivity at high electric fields and the chemical structures of biobased polymers will be also discussed.

ID: CN2017_80016
Title: Catalytic performance of metal azolate frameworks for the solventless synthesis of cyclic carbonates from CO2 and epoxides
Name: Han Ung Kim
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Abstract
Two types of metal azolate frameworks (MAFs) with uncoordinated and coordinated nitrogen atoms built of zinc coordinated with linkerof 3-amino-1,2,4-triazoleand 3,5-dimethyl-1,2,4-triazole denoted as MAF-66 andMAF-X5 has been synthesized

and characterized byusing various physicochemical techniques. The uncoordinated N donors present in the metal azolateframeworks have high adsorption affinity for carbon dioxide. The synthesized MAFs achieved promising catalytic activity towards the cycloaddition of carbon dioxide and epoxides under solvent-free conditions with excellent selectivity towards the desired five-membered cyclic carbonates. Importance of uncoordinatedN donors and amine groups in effectivelycatalyzing thecycloaddition of CO2and epoxides were investigated. Both catalysts were separable by simple filtration and were reusable without any considerable loss of initial activity. Various reaction parameter studies including temperature, reaction time, and CO2pressure were carried out. The possible reaction mechanism explaining the role of amine groupsin cycloaddition reaction was suggested based on literatures and experimental inferences.

Technical Session 4: Physics Series III

ID: APSS2017_80002
Title: Unification of Gravity and Electromagnetism
Name: Mohammed El-Lakany
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Abstract
Discovery of the link between gravity and electromagnetism lead to good understanding of physics; Gravity and electromagnetism are two sides of the same coin; this is the clue of this unification; the two sides are representing by two mathematical structures, symmetric represents gravity and antisymmetric represent electromagnetism. Einstein's gravitational field equation represents the symmetric mathematical structure and we will use stress energy tensor definition for each part in electrodynamics Lagrangian to construct the antisymmetric mathematical structure; electrodynamics Lagrangian is three parts, for electromagnetic field, Dirac field and third part for interaction. Symmetric and antisymmetric gravitational field equations are two sides of the same Lagrangian.

ID: APSS2017_80003
Title: Design of a compact cycloidal drive for aerospace applications.
Name: Naveen p
Affiliation: Department of Instrumentation and Control Engineering, Manipal Institute of Technology, Manipal University,
Email: naveennambram@gmail.com

Abstract
A highly efficient, reliable epitrochoid disc with extraordinary working features in both kinematics as well as in dynamic wing is a kind of speed reducer. This mechanism based on its application can replace the now existing system that uses gears as the prime source for speed reducing. This reduces the stress, wear and tear between moving parts also increases the efficiency. A required gear ratio is obtained by doing few alterations in the design. In the paper, a cycloidal drive is designed and constructed based on certain parameters that defined the profile lobe and the main parts of the system. A three-dimensional solid model and its assembly model are constructed on a CAD platform. Point force analysis on the disc and finite element analysis, structural analysis on

the dynamic parts are calculated and simulated. This design approach is used to replace a few mechanisms in the aerospace sector which a part of it will be discussed in the paper.

ID: APSS2017_80009

Title: Derivation of Specific Velocity of Body Moving Under Gravity with Zero Total Energy*

Name: V.B.S.S.Murthy Tadepalli
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Email: tvbssmurthy@gmail.com

Abstract

Mathematical solutions predict abstract conditions that indicate limits or bounds for physical processes. Generally, experimental verifications and physical observations on physical processes validate the mathematical predictions. Sometimes these predictions lead to new theories and concepts that form basis of better understanding of the natural processes. Gravitational interactions between bodies are natural physical processes. A smaller body moves under the influence of gravity, due the gravitational effect of another large body. Newton's classical gravitational theory addresses the interactions at low velocities. Einstein's general relativity provides firm basis for gravitational interactions. Observations over past 100 years prove the mathematical precision and predictions of general relativity. Einstein's special relativity forms the foundation of quantum physics. In this paper, the author applies concepts of special relativity to classical two body Newtonian gravitational problem. The study predicts a new mathematically viable condition that when a body moves at a specific velocity derived in this paper, the total energy of the moving body is zero. The specific velocity is a constant. At velocities far less than specific velocity, the total energy is negative and is equal to classical value of half the potential energy. At velocities, greater the specific velocity the total energy is positive. The specific velocity condition also enables determination of specific mass of gravitating body, as well as the specific distance of the moving body from gravitating body, at which the total energy of moving body is zero.

ID: APSS2017_80011

Title: About the energy interval beyond the ankle where the cosmic radiation consists only of ultraheavy nuclei from Zinc to the Actinides

Name: Antonio Codino
Affiliation: University of Perugia, Italy and INFN
Email: antonio.codino@pg.infn.it

Abstract

According to recent measurements the tendency of the chemical composition above the ankle is characterized by
increasing fractions of intermediate and heavy nuclei and a dominance of light nuclei around the ankle. Calculationof the chemical composition in the range 3.5 x10**18 - 5.0x10**19 eV according to new principles explains both the risingtendency of the heavy component. The calculation is prolonged to the adjacent interval 5 x10**19 - 2.4 x10**21 eV using thesame theoretical background and some features of the observed cosmic-ray spectrum. It results that above the energyof 6.7x10**20 eV, where the flux is estimated to be 1.8x10**-□30 particles/m2 s sr GeV, the cosmic radiation consistsonly of nuclei heavier than Zinc. Measurements of the spectrum of present and past experiments are compared with
the calculations.

ID: APSS2017_80016

Title: Exotic orbits of asteroids in the solar system and their impacts on space missions

Name: Richard Schwarz
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Abstract

Speaking of exotic orbits we mean objects in co-orbital motion. Objects in co-orbital motion are two celestial bodies moving in the same orbit or similar distance to the central body then they are in the so called 1:1 mean motion resonance (MMR). There are several configurations of co-orbital objects, depending on their point of libration.1. The satellite configuration.2. A common configuration in our Solar System especially for asteroids is the so-called Trojans. These are two groups of asteroids moving close to the equilibrium points (Lagrangian points) L4 and L5 in a 1:1 mean motion resonance with Jupiter (also with Earth, Mars, Uranus and Neptune). That means that Jupiter's Trojans are moving either close to 60 ° ahead respectively 60 ° behind the Jupiter with the same semi-major axis as the planet.3. Similar class to the Trojan class is the horseshoe orbits, in which objects librates around 180 ° from the planet.4. Another exotic class of orbits is the exchange orbit that occurs when two co-orbital objects are of similar masses and thus exert a non-negligible influence on each other. The objects can exchange semi-major axes (e.g. Saturnian moons Janus and Epimetheus) or eccentricities when they approach each other.

After the success of space missions like SOHO and Herschel-Plank the
scientific interest increased towards to the benefit of the Lagrangian
points and other exotic motions.

ID: CCM2017_80005

Title: Effect of hole size on flow structure and mixing characteristic in a multi-hole baffled micro combustor

Name: Won Hyun Kim
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Abstract

Flow structure and mixing properties by the baffle shape are numerically studied for a baffled micro combustor. The baffle shape is changed by various fuel and hole sizes. The numerical simulations based on different geometric conditions are performed by using the Reynolds Stress Model. The fuel-air mixing is greatly affected by flow recirculations. The centrally located flow recirculation has an important role for the entire mixing performance. The results show that this feature depends on the baffle configurations, and the baffle with small air holes represents efficient characters.

ID: CCM2017_80007

Title: Effect of inlet velocity on the crude oil coking and gas phase formation in a straight pipe

Name: FOUZIA DAHMANI
Affiliation: Mechanical engineering
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Abstract

comparative numerical study is conducted to evaluate the effect of inlet velocity on the
gas-liquid-solid phase change, the separation of phases and the coke formation. The numerical
procedure is constructed within the Eulerian framework in which the liquid phase is treated as a
continuous phase while gas and solid are both considered as dispersed phases. The

simplified
reaction net of crude oil is used in order to predict the thermal cracking of the crude oil. The
temperature distribution, flow field, liquid–gas phase separation, and coke formation are predicted
and discussed for different inlet velocities. The information predicted by the CFD model
can be utilized in the optimal design of industrial fired furnaces.

ID: CCM2017_80009
Title: Numerical study of the hydrodynamic performance of two wiggling hydrofoils in diagonal arrangement
Name: Xingjian Lin
Affiliation: The School of Aircraft Engineering, Nanchang Hangkong University
Email: 850296072@qq.com

Abstract
The hydrodynamics in fish school are studied through simulating the flow over two wiggling hydrofoils in diagonal arrangement by used the immersed boundary method, both in-phase and anti-phase wiggling motions are considered in this study, the effect of the longitudinal spacing on the hydrodynamic performance has been investigated. It is revealed that, when the longitudinal spacing is smaller than body length, the diagonal formation is helpful to the follower but harmful to the leader; when the longitudinal spacing is larger than body length, the opposite effect is occurring; and a significant enhancement of the propulsive performance is obtained when the longitudinal spacing is optimized.

ID: ICSPD2017_80003
Title: Adiabatic Potential Energy Surface of Jahn-Teller Centers in CdSe:Cr2+ Crystal with a Quadratic T⊗(e+t2) Problem
Name: Vladimir Gudkov
Affiliation: Ural Federal University, Russia
Email: vlgud@ya.ru

Abstract
Using the data on the temperature dependence of ultrasonic attenuation measured for normal modes of different polarization, the extrema points of the adiabatic potential energy surface (APES) of the CrSe4 tetrahedral Jahn-Teller (JT) centers in the host cadmium selenide crystal have been revealed and analyzed. Calculations were carried out taking into account the linear and quadratic vibronic coupling assuming that the JT effect on each impurity center is independent of the other ones, and the global minima of the APES are of orthorhombic symmetry.

ID: NAA2017_80000
Title: Elastic Moduli in Cadmium Selenide doped with Chromium
Name: Vladimir Gudkov
Affiliation: Ural Federal University, Russa
Email: vlgud@ya.ru

Abstract
Temperature dependence of elastic moduli (C_11-C_12)/2, C_33, and C_44, the latter for the piezo-active and non-piezo-active versions, have been measured in the interval of 4 – 180 K at 28–262 MHz in a CdSe:Cr2+ crystal. Anomalies below 40 K have been found for all the moduli, except C_33. The interpretation of the results has been carried out involving the Jahn-Teller effect and relaxation between the equivalent distortions of the tetrahedral CrSe4 centers.

Part V Instructions for Presentations

Oral Presentation

Devices Provided by the Conference Organizing Committee:

- Laptops (with MS-office & Adobe Reader)
- Projectors & Screen
- Laser Sticks

Materials Provided by the Presenters:

- PowerPoint or PDF files

Duration of each Presentation:

- Regular Oral Session: 10 Minutes of Presentation
- Plenary Speech: 30 Minutes of Presentation

Poster Presentation

Materials Provided by the Conference Organizing Committee:

- X Racks & Base Fabric Canvases (60cm×160cm, see the figure below)
- Adhesive Tapes or Clamps

Materials Provided by the Presenters:

- Home-made Posters

Requirement for the Posters:

- Material: not limited, can be posted on the Canvases
- Size: smaller than 60cm×160cm
- Content: for demonstration of the presenter's paper

Requirement for the Presenters:

Stand beside his (her) Poster through the Session, and discuss with the readers about his (her) paper

Part VI Hotel Information

About Hotel

Arnoma Grand Bangkok (曼谷阿诺玛酒店) situated in the heart of Bangkok's Central Business area and surrounded by some of Bangkok's most prestigious Business Addresses, Arnoma is also across the road from Centralworld's 400 Shops and Restaurants, close to some of Asia's most renowned Designer Malls, and just around the corner from the BTS Sky train which will whisk you all over Bangkok in minutes.

Located in the popular Siam / Pratunam area, Arnoma has 369 Rooms and Suites, a selection of modern, flexible Meeting Rooms – including a Ballroom capable of seating up to 800 in Theatre Style – and great dining options including Bistro 99 which serves cutting edge, Modern Thai Cuisine, the award winning Good Earth Chinese Restaurant, Felice Italian Restaurant and a buzzing Wine Pub.

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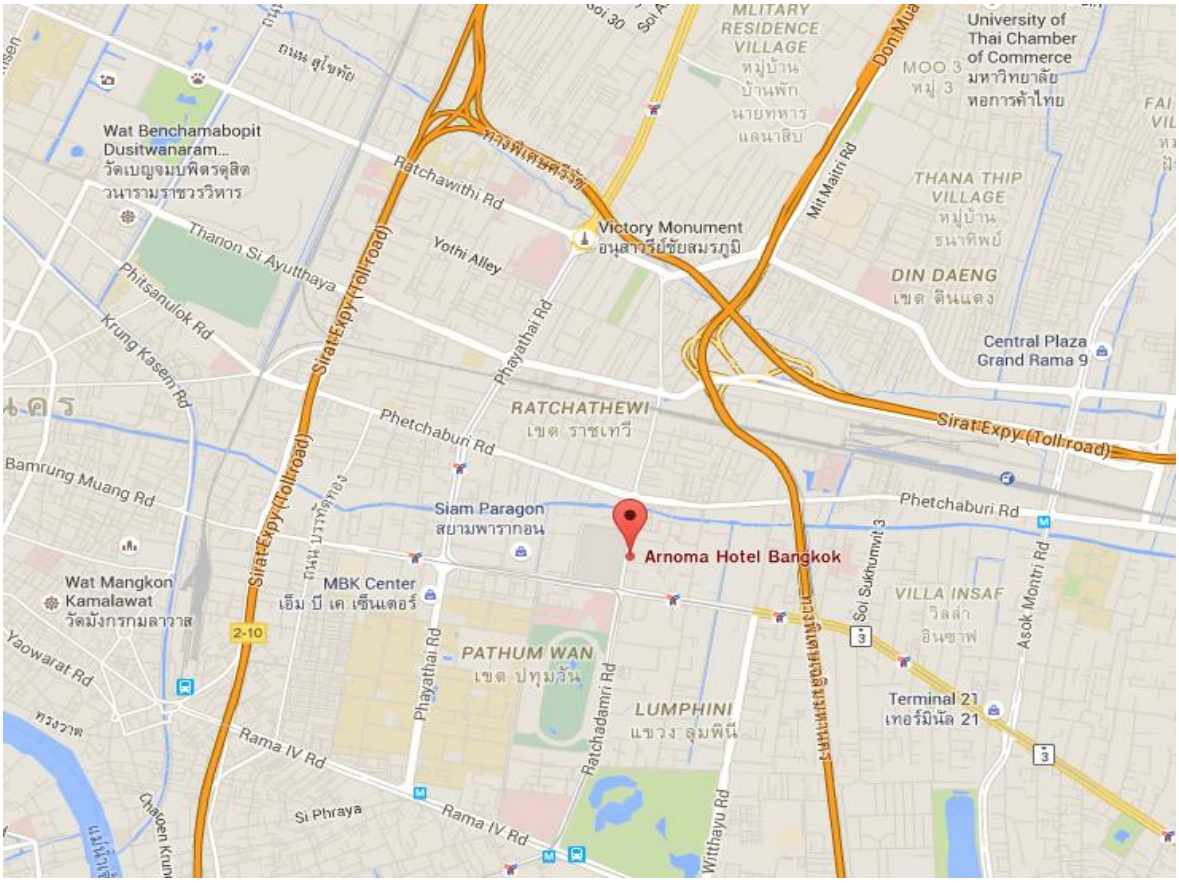
Wat Benchamabopit Dusitwanaram...
วัดเบญจมบพิตรดุสิตวนารามราชวรวิหาร
Victory Monument
อนุสาวรีย์ชัยสมรภูมิ
Ratchawithi Rd
Thanon Si Ayutthaya
Phitsanulok Rd
Krung Kasem Rd
Sirat Expy (Toll road)
Yothi Alley
Phayathai Rd
Mit Maitri Rd
MLITARY RESIDENCE VILLAGE
หมู่บ้านพักนายทหารแลนาสิบ
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VILLA INSAF
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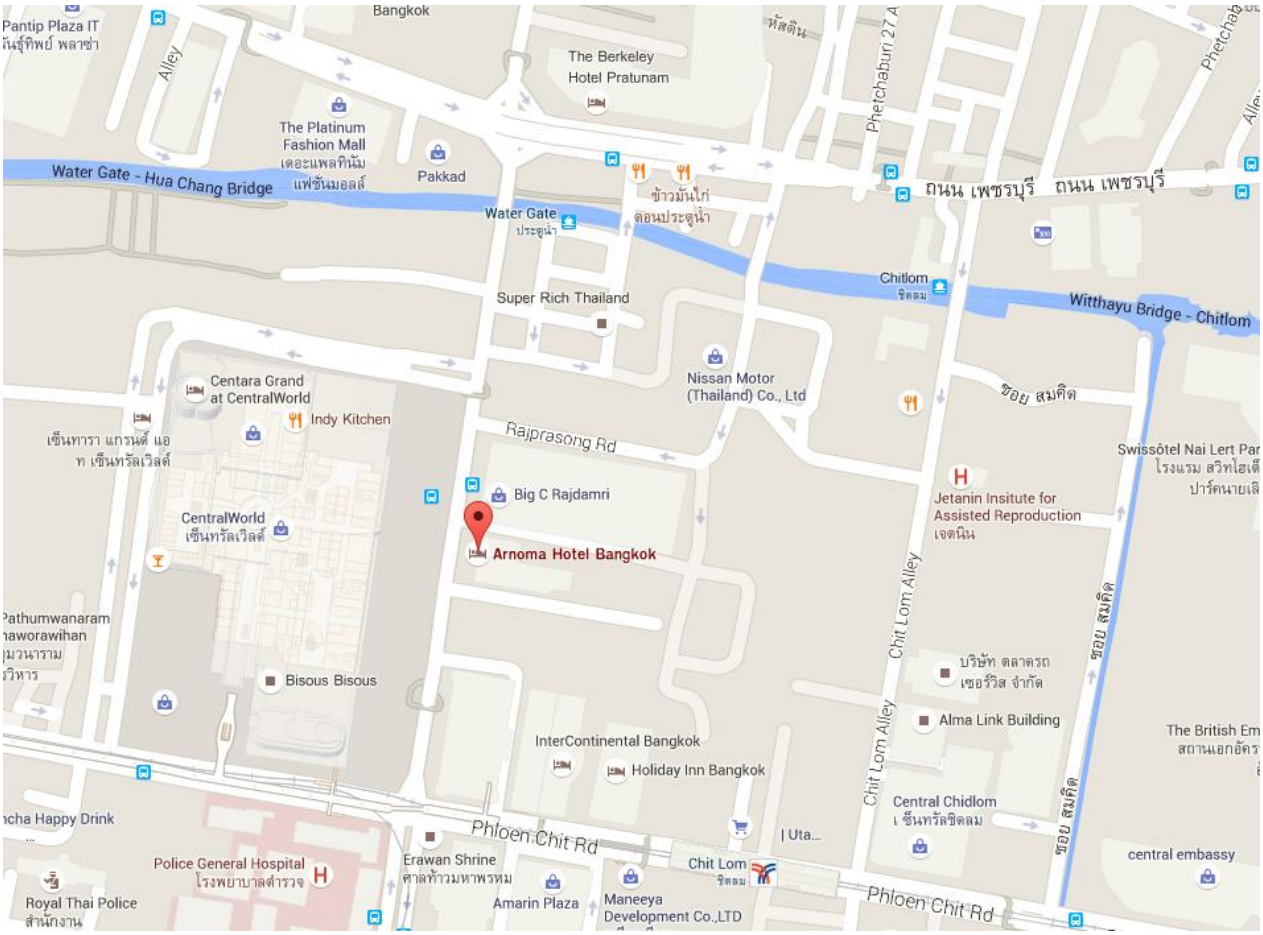
Asok Montri Rd
2-10
Yaowarat Rd
PATHUM WAN
เขต ปทุมวัน
Ratchadamri Rd
LUMPHINI
แขวง ลุมพินี
Terminal 21
เทอร์มินัล 21
Rama IV Rd
Si Phraya
Witthayu Rd


Pantip Plaza IT
The Berkeley Hotel Pratunam
The Platinum Fashion Mall
Pakkad
Water Gate - Hua Chang Bridge
Water Gate
ถนน เพชรบุรี ถนน เพชรบุรี
Chitlom
Witthayu Bridge - Chitlom
Super Rich Thailand
Nissan Motor (Thailand) Co., Ltd
Centara Grand at CentralWorld
Indy Kitchen
Rajprasong Rd
Big C Rajdamri
Arnoma Hotel Bangkok
CentralWorld
Jetanin Insitute for Assisted Reproduction
Swissôtel Nai Lert Par
Chit Lom Alley
Bisous Bisous
Alma Link Building
InterContinental Bangkok
Holiday Inn Bangkok
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Phloen Chit Rd
Police General Hospital
Erawan Shrine
Chit Lom
Amarin Plaza
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central embassy
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