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Part III  Technical Sessions
Materials Science: Technical Session

2019 Conferences Series
# Part I  Conference Schedule

**Time:** August 20-22, 2019  
**Location:** Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

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<tr>
<td>Aug. 20</td>
<td>14:00-17:00</td>
<td>Registration</td>
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| Aug. 21 | 08:30-12:00 | Materials Science Keynote Speech Session 1:  
Chair: Dr. Bin-gang Xu  
Group photo & Coffee Break: 10:00-10:10 | Physics Science Keynote Speech Session 1:  
Chair:  
Group photo & Coffee Break: 09:50-10:00 |
|       | 12:00-13:30 | Lunch | Chinese Restaurant, 2nd Floor |
|       | 14:00-18:00 | Materials Science Keynote Speech Session 2  
Chair:  
Group photo & Coffee Break: 16:00-16:10 | Physics Science Keynote Speech Session 2:  
Chair:  
Group photo & Coffee Break: 16:00-16:10 |
|       | 18:00-19:30 | Dinner | Chinese Restaurant, 2nd Floor |
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Chair:  
Group photo & Coffee Break: 10:00-10:10 | Physics Science Technical Session:  
Chair:  
Group photo & Coffee Break: 10:10-10:20 |
|       | 12:00-13:30 | Lunch | Chinese Restaurant, 2nd Floor |
| Aug. 23 | 07:00-17:30 | One Day Tour (Pending, on own expense) |
Part II  Keynote Speech

Materials Science: Keynote Speech Session 1

Keynote Speech 1: Smart nanomaterials for contaminates removal and resource recycling

Speaker: Dr. Hualin Jiang, Nanchang Hangkong University, China
Time: 08:30-09:00, Wednesday Morning, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Nanomaterials are important tools and have fast developed in contaminates removal and resource recycling in recent years. Several novel nanomaterials recently developed in our groups are reported in this presentation. Including a smart adsorbent equipped with an indicator, a novel hybrid able to simultaneously recover valuable organic and inorganic resource, a new strategy for triggering photocatalytic etc.

Keynote Speech 2: Fiber-based Materials for Wearable Sensing, Energy Harvesting and Storage

Speaker: Dr. Bin-gang Xu, The Hong Kong Polytechnic University, Hong Kong (China)
Time: 09:00-09:30, Wednesday Morning, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Fiber material is composed of a group of flexible fibers that are assembled in a certain dimensionality for a broad spectrum of applications. With its good flexibility, high porosity and large surface area, it demonstrates a great potential in development of flexible and wearable electronics for energy harvesting, energy storage and strain sensing. In this talk, the materials, fabrication and mechanisms for fiber-based wearable electronics ranging from nanogenerators, supercapacitors to tensile strain sensors will be introduced and discussed. Their potential applications in the sustainable development and personal healthcare will also be explored.
Keynote Speech 3: Improvement of Fatigue Strength of Light Metals by Mechanical Surface Treatment

Speaker: Prof. Hitoshi Soyama, Tohoku University, Japan  
Time: 09:30 -10:00, Wednesday Morning, August 21, 2019  
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Light metals such as aluminum alloy, magnesium alloy and titanium alloy are attractive materials for automotive lightweight and aviation components. However, one of weak points is the fatigue strength. One of key technologies for enhancement of fatigue strength is mechanical surface treatments such as shot peening. Unfortunately, it is difficult to improve the fatigue strength of the light metals by conventional shot peening, as solid collision by shot increases surface roughness of because of the softness of the light metals. In the present Keynote Speech, a novel peening method without shot, i.e., shotless peening, will be introduced. In the proposed shotless peening, cavitation impacts, which are normally causes severe damage in hydraulic machineries such as pumps, ship propellers and valves, are used to create local plastic deformations. This peening method is named as “cavitation shotless peening” or simply called as “cavitation peening”. In the speech, the fundamental and the practical application of cavitation peening are introduced with experimental data. The improvement of fatigue strength of additive manufactured titanium alloy Ti6Al4V is also demonstrated comparing with shot peening and laser peening.

Keynote Speech 4: Design and Synthesis of New Transition Metal Chalcogenide Superconductors

Speaker: Prof. Huixia Luo, Sun Yat-Sen University, China  
Time: 10:10-10:40, Wednesday Morning, August 21, 2019  
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Transition-metal chalcogenides have long been of interest due to their rich electronic band structures and physical properties. In our group, we focused on design and synthesis of new transition metal chalcogenide superconductors via several methods
(e.g. solid state method, wet chemical method, flux method, et al.). Combing experiment and theory calculation, a series of new transition-metal chalcogenides superconductors (e.g. 2H-CuxNbSe2, 1T-Ti1-xTaxSe2, TaSe2-xTex, 2H-CuxNbSe2-xSx, Cu0.5Ir2-xMxTe4, Ir1-xMxTe2) have been designed and synthesized. Further, their physical properties such as resistivity, critical fields, magnetic susceptibility and heat capacity et al. were studied in detail. Finally, the superconducting phase diagrams for new transition metal chalcogenide superconductors were made.

Keynote Speech 5: Behaviour of Cu electroplating on Mg alloys

Speaker: Prof. Ching An Huang, Chang Gung University, Taiwan, China
Time: 10:40-11:10, Wednesday Morning, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Mg alloys are known to be lightweight materials for aerospace, medical, automobile and bicycle industries. Owing to having high chemical activity, surface treatments, such as chemical conversion, micro-arc oxidation, anodic oxidation and electroplating, are essential for applications of Mg alloys. In general, electroplating is difficult for Mg alloys which are easily corroded in a plating bath. In this presentation, an eco-friendly electroplating process will be proposed through which a uniform Cu deposit can be deposited on Mg alloys in an alkaline Cu plating bath. The electroplating process includes anodically galvanic etching and Cu electroplating in the alkaline Cu plating bath. A protective deposit, Ni or Cr-C deposit can be further electroplated on the Cu coated-Mg alloy to improve its corrosion and wear resistance. The corrosion and mechanical properties of Ni/Cu- and Cr-C/Cu coated Mg alloys were evaluated. The anodic polarization and potentiostatic etching were used to realize the corrosion resistance of coated Mg alloys. Tensile, wear and fatigue properties of coated Mg alloys were also studied.
Keynote Speech 6: Bi-directional translational research: how practical applications fuel fundamental

Speaker: Dr. Bruno Wacogne, FEMTO-ST Institute, CNRS UMR 6174, Besançon, France
Time: 11:10-11:40, Wednesday Morning, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Translational research consists in translating fundamental research results as closely as possible to patients. Researchers or institutions sometimes underestimate these translational studies because it is thought that, although essential for setting up new investigation tools, they do not deepen fundamental knowledge. However, users face specific difficulties due to biological, physiological and clinical constraints. In other words, new questions and scientific obstacles arise when research is applied to the real world. In order to address these new challenges, reverse translational research is required. This paradigm consists in understanding difficulties faced when accounting for the above mentioned constraints, expressing them in terms of scientific theories and solving them by defining new prisms through which reality is perceived. Consequently, fundamental research is fueled by this renewed perception translational research induces.

In this talk, we illustrate this principle with the development of what is, to the best of our knowledge, the first fluorescence based calibration free micro pH sensor. The expressed need was to continuously monitor some physiological pH related constants inside the human body. The main clinical constraint was therefore the use of the sensor in a calibration free manner. We show how fluorescence pH measurement had to be rethought and how a new physical-chemical understanding of acid-base reactions at the sensor’s surface had to be discovered to address this constraint.

More generally and to open discussions on translational and reversed translational research, we present how we developed bi-directional research actions between practitioners and technology researchers in eastern France.
Keynote Speech 7: Micromechanics-Based Constitutive Modeling of Viscoelastic Particle-Reinforced Composites

Speaker: Prof. Zaoyang Guo, Harbin Institute of Technology, China
Time: 11:40-12:10, Wednesday Morning, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
The micromechanics-based constitutive models are proposed for viscoelastic particle-reinforced composites in both the infinitesimal deformation and finite deformation regimes. A homogenization framework is first constructed for (finite-strain) viscoelastic composites, where the effective free energy density function of each phase is decomposed into the corresponding volumetric, isochoric and dissipative parts. The long-term (purely elastic) behaviors of both the matrix and particles are described by the incompressible neo-Hookean models in the finite deformation regime. The effective elastic free energy density functions of the two phases are computed based on a recently developed homogenization procedure in Guo et al. (Guo et al. in Mechanics of Materials 70 (2014), 1-17) and the average stress of each phase is can be derived. This homogenization procedure can be applied to the infinitesimal deformation regime. Cubic units with 27 non-overlapping randomly distributed same-sized spheres are constructed as the representative volume element (RVE) models of the particle-reinforced composites. The finite element simulations of various deformations with different strain rates are performed for the RVE models of different particle volume fractions and material parameters to validate the constitutive models. The simulation results show that the constitutive models can well predict the effective viscoelastic responses of the particle-reinforced composites in both the infinitesimal and finite deformation regimes.
Keynote Speech 8: Experimental study of the phase equilibria in the R-Al-Si ternary systems (R: rare earth element) the Ho-Al-Si isothermal section at 500°C

Speaker: Prof. Anna Maria Cardinale, the University of Genova, Italy
Time: 12:10-12:40, Wednesday Morning, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
The Al-Si alloys, both in the as cast and after thermal treatment conditions, have been recognized as interesting materials for the industries (e.g., automotive, heat exchanger, etc.). The addition of a rare earth element, at a very low concentration, can modify the property of the alloys, improving some useful characters as low density and thermal expansion coefficients, good casting performance and weldability, high wear resistance and temperature strength, good corrosion resistance. All of the above leads to an increasing interest in the study of R-Al-Si based alloys (R being a trivalent rare earth element). The knowledge of the phase equilibria and the transformations that take place during the solidification pathway of foundry aluminum based alloys are crucial, especially in planning and develop new materials. The industrially relevant R-Al-Si alloys have usually a concentration lying near the binary Al-Si eutectic composition and mischmetal (alloy of rare earth metals, whose typical composition includes approximately 50% Ce, 25% La and smaller small amounts of Nd and Pr) is often added.

Moreover, owing to the definition of pseudo-lanthanide it is possible to predict the behavior of an intermetallic phase not prepared yet, when experimental data are available for the adjacent members of this series. Taking into account the aforementioned considerations, investigations of a number of R-Al-Si systems have been carried out by our research group.

To our best effort literature data on R-Al-Si systems isothermal sections (in the whole range of concentrations) and liquidus projections mainly deal with the following, reported in figure 1 and figure 2 respectively: La-Al-Si (0-33 at% La), Ce-Al-Si, Pr-Al-Si, Nd-Al-Si, Sm-Al-Si and refs therein, Eu-Al-Si, Gd-Al-Si, Al-Si-Tb and Al-Si-Dy, Ho-Al-Si (0-33 at% Ho), Er-Al-Si and Y-Al-Si (0-33 at% Y). In this work will be presented the results obtained in the experimental study of the whole Ho-Al-Si isothermal section at 500°C, in comparison with the R-Al-Si systems previously studied (R: Pr, Nd, Sm, Eu, Gd, Tb, Dy and Er as concern the isothermal sections; Pr, Nd and Sm as concern the liquidus projections in the Al rich corner). The experimental techniques used have been scanning electron microscopy (SEM), electron microprobe analysis (EDXS), X-ray powder diffraction (PXRD) and differential thermal analysis (DTA).

By comparing the different ternary isothermal sections, fig.1, some points can be highlighted. All the sections are characterized by the presence of intermediate phases with R content up to 60 at% rare earth. The number of phases decreases on going from the light (Pr, Nd, Sm) to the heavy rare earths (Gd, Tb, Dy, Er). Only the RAl2Si2 compounds form along the whole lanthanides series and these phases are point compounds. At low R content the three-phase equilibrium: (Al) / (Si) / RAl2Si2,
common to all the R-Al-Si ternary systems, occurs. Many R-Si and R-Al compounds extend in the ternary system forming solid solutions at a constant R-content.

As the liquid projections in figure 2, the investigated systems (R= Pr, Nd, Sm) show the Al-rich ternary eutectic equilibrium L (Al) + (Si)+ RAl2Si2 at the temperatures: Pr- 567°C, Nd- 561°C, Sm- 567°C. Near the boundary R-Al binary systems, the primary crystallization regions, common to these systems, are (Al), (Si), RAl2Si2 and RAlSi. Moreover, further primary crystallization regions have been found for R= Pr and Sm (SmAl3 and Pr3Al11 respectively).

**Keynote Speech 9: Printed Organic Light Emitting Diodes – Problems and Perspectives**

**Speaker:** Prof. Jacek Ulanski, Lodz University of Technology, Poland  
**Time:** 12:40-13:10, Wednesday Morning, August 21, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**

Organic electronics offers several advantages as compare with inorganic technology, such as lightweight, large area, flexibility or conformability of electronic devices. Additionally, if organic electronics is based on solution processable materials, it should allow to employ cheap and energy-saving printing techniques for mass fabrication of very broad range of electronic components. Among them printable organic light emitting diodes (OLEDs) attract a special attention since the OLEDs fabricated by vacuum deposition technology are already applied on large scale in displays and monitors since many years. However the technique of printing OLEDs cannot overcome laboratory scale and in fact in most published reports, only one or two layers in these devices are printed, while the rest are deposited by vacuum evaporation technique. This is due to a number of serious obstacles hindering possibility of fabrication by means of solution based techniques and with high precision multilayer OLED structures.

In this talk we will analyse the most important problems, which are still not fully solved, such as low efficiency of OLEDs due to difficulties in employing triplet states, lack of proper printable interlayers, allowing to facilitate injection of one sign charge carriers and to block charge carriers of opposite sign, technical problems with producing multilayers structures, lack of conducting inks, compatible with active organic layers, poor precision and low resolution of available printers, and lack of flexible, transparent and highly efficient barrier materials. In the Department of Molecular Physics of Lodz University of Technology we are involved since several years in research aiming to solve the most critical issues related to printed organic electronics and we will present selected
results illustrating application of new solution processable active layers exhibiting electrophosphorescence or thermally delayed fluorescence (TADF), printable interlayers and electrodes, as well as our approach for ink formulation and high precision printing technique. These results will be used as a base for presentation of future research plans and perspectives for developing technology of fully printable OLEDs.

Materials Science: Keynote Speech Session 2

Keynote Speech 10: Optical Responses of Two-Dimensional Materials – Valleytronics and Phase Transition

**Speaker:** Prof. Jian Zhou, Xi’an Jiaotong University, China  
**Time:** 14:00-14:30, Wednesday Afternoon, August 21, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**  
In order to manipulate and tune the physical properties of a material, usually one has to apply an external field, such as elastic and inelastic strain, electric field, magnetic field, or light illumination. Among these strategies, the optical field is a far field, which does not need mechanical or electrochemical contact or patterning onto material samples. In this talk, I will discuss optical responses of low-dimensional nanoscale materials, mainly focusing on two promising aspects, namely, valleytronics and phase transition. The close connection between the circularly polarized light with valleytronics is initiated by the discovery of two-dimensional transition metal dichalcogenides. Here, I will discuss some progress in our group, such as valley polarized topological feature, valley polarized Nernst effect, and valley polarized plasmonic behaviors, based on the same honeycomb lattice model. I will also discuss our predictions on the modification of Gibbs free energy of two-dimensional materials under linearly polarized light illumination, and consequent phase transition of these materials.
**Keynote Speech 11: Research and Development of Novel Pressure Sensitive Adhesives from Vegetable Oils**

**Speaker:** Prof. Kaichang Li, Oregon State University, USA  
**Time:** 14:30-15:00, Wednesday Afternoon, August 21, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**  
Pressure sensitive adhesives (PSAs) are widely used in pressure sensitive labels, tapes, stamps, Post-it notes and many other products. At present, PSAs are mainly derived from petrochemicals that are not renewable and not sustainable. In this presentation, we will disclose our new discovery that polyesters from polymerization of epoxy compounds and carboxylic acids can have superior PSA properties. The polyesters can be prepared from polymerization of epoxidized fatty acids such as epoxidized oleic acid, a bifunctional AB monomer containing a carboxylic acid group (A) and an epoxy group (B); polymerization of epoxidized soybean oils containing multiple epoxy groups and a dibasic acid such as dimer acids; or polymerization of epoxy resins containing two epoxy groups and a dibasic acid. Innovative methods for preparation of PSAs with superior properties have been successfully developed. The resulting PSAs have been characterized for their molecular structures, thermal stabilities, and viscoelastic properties. The peel strength, shear strength, tack, and aging stability of the resulting PSAs have also been evaluated and will be discussed in detail in this presentation. The relationships between chemical structures of the epoxy compounds and dibasic acids, and PSA properties have been extensively investigated and will be present and discussed in detail.
Keynote Speech 12: Simulation and Visualizing study for Formation, Evolution and Hereditary Mechanisms of Nano-Clusters During Solidification Processes of Liquid Metals and Alloys under high pressures

Speaker: Prof. Rang-Su Liu, Hunan University, China  
Time: 15:00-15:30, Wednesday Afternoon, August 21, 2019  
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
In recent years, we have deeply investigated the solidification processes of liquid metals of Al, Ag, Cu, Mg Na, Pb, Zn and alloys of Mg-Zn, Mg-Y, Al-Mg, Al-Zn, Ca-Zn by molecular dynamics simulation for the systems with different sizes of 100,000, 1,000,000 and 10,000,000 atoms, respectively. By using the visualizing method, the formation, evolution and hereditary mechanisms of nano-clusters, especially, under high pressures the large-scale microstructural evolution, the crystallization and the hereditary mechanisms during their solidification processes have been clearly analyzed and described by the cluster type index method (CTIM) proposed by authors. Recently, many important results obtained. Highly interesting, for liquid Ni, it is found for the first time that there is an important phase transformation point from FCC to BCC structures between 20 ~ 22.5GPa during the solidification processes from the same initial liquid system at the same cooling rate. And the effect of increasing pressure is similar to that of decreasing cooling rate for the phase transformation of microstructures during solidification process of liquid metal Ni system, though they have different concrete effecting mechanisms.

Keynote Speech 13: Nonamaterials Composed of Activated Carbons and Transition Metal Dichalcogenides in Applications of Sensing and Catalysis

Speaker: Prof. King-Chuen Lin, National Taiwan University, Chinese Taipei  
Time: 15:30-16:00, Wednesday Afternoon, August 21, 2019  
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Palladium nanoparticles (Pd NPs) immobilized on a garlic skin-derived activated carbons (GACs) was synthesized. The morphology, structure, surface compositions, and textural properties of the GACs and Pd@GAC catalyst were examined by
a variety of physicochemical characterization techniques which revealed a dispersion of Pd NPs with average particle size of ca. 21 nm on sheet-like graphitized GACs. The Pd@GAC catalyst, which can be facilely prepared with biowaste feedstocks, exhibited excellent catalytic performances for efficient reduction of Cr (VI) with extraordinary stability and recyclability over at least five repeated catalytic test cycles. On the other hand, we report the synthesis, characterization, and catalytic application of ruthenium nanoparticles (Ru NPs) supported on plastic-derived carbons (PDCs) synthesized from plastic wastes (soft drink bottles) as an alternative carbon source. The catalytic activity of Ru@PDC for the reduction of potassium hexacyanoferrate (III), (K3[Fe(CN)6]), and new fuchsin (NF) dye by NaBH4 was performed under mild conditions.

Further, we present ultra-sensitive sensing of a prostate-specific antigen (PSA), which is used as a biomarker to detect prostate cancer, using a molybdenum series (MoO3, MoS2, and MoSe2) of two-dimensional nanosheets (2D NSs). The design of a 2D NS-based PSA aptamer sensor system was demonstrated based on a fluorescence turn-on mechanism in the presence of a target. The detection limit of PSA was achieved to be 13 pM for MoO3 NSs, whereas the MoS2 and MoSe2 systems exhibited a detection limit of 72 and 157 pM, respectively. The in vitro bioimaging measurements were also performed using confocal fluorescence microscopy. Herein, PSA detection was successfully demonstrated in human embryonic kidney 293T (HEK) live cells. Moreover, the MoO3, MoS2, and MoSe2 NSs exhibit excellent biocompatibility and low toxicity; thus, these 2D NSs can be used as a promising sensor platform to detect prostate cancer. More chemical and bio-sensing applications will be reported based on the nanomaterial of transition metal dichalcogenides.

Keynote Speech 14: Manufacturing of hiHep Cells-Based Artificial Liver Support System Using Digital Light Processing

Speaker: Prof. Jun Yin, Zhejiang University, China
Time: 16:10-16:40, Wednesday Afternoon, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Currently, the liver cancer leads to the highest morbidity among all kinds of cancers in the world. Due to the shortage of liver donors for transplantation, the surgical resection is still considered as one of the most effective treatments for benign and malignant liver tumors. However, the postoperative liver failure has been found to be the most serious complication of a large number of patients with liver resection.

In this study, a scaffold with liver cells was designed with a serrated construct and fabricated as the
artificial liver support system, which is used to replace the cutting off liver part to perform some of the functions of synthesis and metabolism. A multi-material digital light processing (DLP) technology was developed to manufacture the artificial liver support system. Gelatin methacyryloyl (GelMA) was used as the cell-laden bioink, where dECM (decellularized extracellular matrix) was also added; and the hiHep cells were printed with GelMA/dECM hydrogels to fabricate designed constructs. By measuring the printing resolution and the cell viability after printing, the optimized printing parameters and formula of GelMA/dECM bioink were obtained. It should be noticed that dECM was found to be helpful for both cell viability and printability of the bioink. The printed artificial liver support system was found to have the similar function with original liver to synthesize albumin and metabolize urea which provided a promising approach to solve liver failure for liver function recovery and regeneration.

Keynote Speech 15: Development of integrated devices technologies by miniaturization and new materials, and what after?

Speaker: Prof. Hiroshi Iwai, Tokyo Institute of Technology, Japan
Time: 16:40-17:10, Wednesday Afternoon, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Electronics started in early 1900’s with the invention of vacuum tubes. This was a great technological revolution. Then, the next technological evolution started in early 1970’s by the invention of microelectronics or integrated circuits (IC) composed of huge number of tiny MOSFETs with micrometer size. The performance and cost of the IC per function have unbelievably improved by the continuous miniaturization of the MOSFETs. Now, the microelectronics have evolved to the nanoelectronics and micro-/nano-electronics is the base of smart society for today and near-future, which is characterized by internet, IoT, and AI. In other words, without micro-/nano-electronics technologies, internet, IoT and AI would not exist.

However, it is expected that the miniaturization will reach its limit within 10 years, because of several reasons.

Then, what about the development of integrated circuits or integrated devices (ID) technologies after the end of miniaturization? Integrated circuits miniaturization technologies for logic and memory will diffuse and diverse to various kinds of devices such as power, photovoltaic, sensor, energy storage etc, in the coming IoT, 5/6G and AI era. In near future, many different kinds of devices will be integrated or connected on-chip, in package, or by wired/wireless networks, and will form integrated devices for smart system suitable for that era. The introduction of new materials will be more active as well as the miniaturization of the various kinds of devices.
Then, for a long term for several tens of years, what would be the direction of the integrated devices? We will have to introduce bio systems in combination with the semiconductor devices. Today, AI has made remarkable progress because of the introduction of deep machine-learning as well as the tremendous performance improvement by the semiconductor device miniaturization. However, it is a big problem that AI needs extremely huge power for the learning of each single application. On the other hand, power/energy consumption of bio system such as brains of human, animals and insects are extremely low, and those brains are extremely efficient. There will a big difference in the hardware between the semiconductor devices and brains, and the semiconductor devices cannot compete with the bio system by several reasons.

In this talk, brief history of integrated circuits development with miniaturization and introduction of new materials are explained. Then, integrated devices developments for near and long future will be discussed.

Keynote Speech 16: Failure Analysis of Laminated Composites

Speaker: Prof. Zheng-Ming Huang, Tongji University, China
Time: 17:10-17:40, Wednesday Afternoon, August 21, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
In this report, we firstly point out that all kinds of composite failures can be analyzed through micromechanics only. One apparent reason is as such: given the composite subjected to any arbitrary load, one cannot tell when the interface debonding between the fiber and matrix will occur if he does not know the internal stresses in the fiber and matrix. The latter is obtainable only by micromechanics. And this problem has been resolved, and is presented in this report.

Secondly, we demonstrate that the internal stresses in the fiber and matrix obtained by a micromechanics theory are homogenized quantities, which must be converted into “true” values before a failure assessment can be efficiently made. The true stresses of the matrix are very much different from its homogenized counterparts. It is the true stresses of the matrix that open the door to solving all kinds of composite failure problems.

Lastly, we show that the failure and strength of a laminated composite subjected to various types of loads can be efficiently assessed only using the original fiber and matrix properties, plus a transverse tensile strength of a unidirectional composite if an earlier interface crack is involved. Several examples are included.
Keynote Speech 17: Atomistic Simulation Study of Aluminum-Lead Solid-Liquid Interfaces

**Speaker:** Dr. Yang Yang, East China Normal University, China  
**Time:** 08:30-09:00, Thursday Morning, August 22, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**  
The properties of solid-liquid interfaces (SLIs) govern a wide variety of processes of technological import, e.g., wetting, heterogeneous nucleation, casting, and crystal morphology and growth. We examined the chemically heterogeneous Al-Pb SLI to determine how interfacial structure and dynamics affect phenomena of experimental interest. Transmission electron microscopy experiments show that liquid Pb inclusions undergo Brownian motion within a solid Al matrix, using molecular-dynamics simulations as well as the characterization methodology explicitly developed for the Al-Pb SLIs, we found Al-Pb solid-liquid interfaces [Phys. Rev. Lett, 110, 096102 (2013)] exhibit premelting transition below the melting point of Al. I will present in this talk: i) the roles played by Al diffusion and the interfacial premelting phase transition at the solid-liquid interfaces in the phenomenon (Brownian motion of Pb inclusion within the Al matrix), ii) The spreading kinetics of Pb droplets on Al substrate, the effect of this premelting on the droplet spreading kinetics, and effect of premelting on the droplet equilibrium contact angle. iii) Some preliminary results on the interactions between the Al crystal-melt interfaces and the liquid phase Pb inclusions during the rapid solidification.

Keynote Speech 18: Reducing power loss in p-i-n organic light emitting diodes: an attempt to advance towards the thermodynamic limit

**Speaker:** Prof. Dashan Qin, Hebei University of Technology, China  
**Time:** 09:00-09:30, Thursday Morning, August 22, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**  
Organic light emitting diodes (OLEDs) have been moving fast towards the commercialization during the past decades, because of their appealing merits such as easy fabrication, flexibility, low weight, etc. The OLEDs based on p-i-n concept have been successfully made small- to medium-sized flat-panel displays widely used in mobile phones.
However, the TVs and lighting panel based on the modern OLED technology are still suffering from fast aging, high cost, and image retention. Therefore, it is of great importance to improve the performance of p-i-n OLEDs well established as the quasi-standard technology of OLED industry.

Like GaN LEDs, a good OLED must be a good diode featuring low power loss, i.e., low thermal generation. The electro-thermal effect is a major factor leading to the degradation of OLED especially at high luminance. For state-of-art p-i-n OLEDs, the heat is generated in emissive layer due to its large series resistance; in addition, the heat is also created in the p-doped and n-doped layers. At a given practical luminance, e.g., 500 cd/m2, the voltage drops over p- and n-doped transport layers are comparable to that over emissive layer. Thus, it is worth investigating the power loss caused by p- and n-doped transport layers. In general, there are three kinds of hole (power) losses incurred in p-i-n OLEDs, i.e., the injection loss from ITO to p-doped layer, conduction loss through p-doped layer, and interfacial loss from p-doped layer to electron blocking layer. It has been demonstrated that the usage of a single p-doped layer is unable to optimize these hole losses simultaneously. The similar case is also found for using a single n-doped transport layer.

In this speech, I will talk of the influences of the HOMO level of p-type host, p-dopant type, and p-doping profile on the hole losses, and then point out that the combination of multi-p-doped layers outperforms any single p-doped layers in both fluorescent and phosphorescent OLEDs. Also, I will show the combined n-doped layers outperform single n-doped layers. Hopefully, the p- and n-doping structures proposed here can advance OLEDs into the TV and lighting applications in a cost-effective way.

**Keynote Speech 19: Development of a Novel Dispersing Agent for Graphene Oxide in Cementitious Materials**

**Speaker:** Prof. Kung-Chung Hsu, National Taiwan Normal University, Chinese Taipei  
**Time:** 09:30-10:00, Thursday Morning, August 22, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**  
Graphene nano-sheets and its derivatives have been applied in many areas including electronics, optics, and bio-devices. Recently, a novel application is to use them in cementitious materials. In this presentation, a short review on recent research results about graphene oxide (GO) modified cement-based materials was made. The review mainly discussed the influence of GO on properties of cementitious materials in term of cement hydration, mechanical properties, etc. Furthermore, good dispersion of GO in cementitious materials is critical in achieving the
enhancement of these nano-sheets. Up to now, commercial superplasticizers such as sulfonated naphthalene formaldehyde condensates or polycarboxylates are used as dispersing agents of GO nano-sheets. In our lab, we have prepared a new dispersion agent. Compared to commercial superplasticizers, the prepared dispersant shows better dispersion property in pore solutions, and the resulting GO-contained mortars exhibit greater compressive strength and flexural strength.

Keynote Speech 20: Solute Convection on Pore Shape Development in Solid

Speaker: Prof. Peng-Sheng Wei, National Sun Yat-Sen University, Chinese Taipei
Time: 10:10-10:40, Thursday Morning, August 22, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
The effects of transport processes on the shapes of pores resulting from entrapped bubbles during solidification are numerically and theoretically investigated. Bubble formation results from supersaturation of dissolved gases in the liquid ahead of the solidification front. Pore formation and its shape in solid influence not only microstructure of materials, but also contemporary issues of biology, engineering, foods, geophysics and climate change, etc. In this study, equations of fluid flow, heat transfer and solute concentration are solved by using commercial COMSOL computer code. Scaling analysis shows that solute convection plays an important role in pore shape development during solidification. Solute convection influences not only thickness of solute concentration on the bubble cap, but also time for bubble entrapment. This work is critical to understand and control different types and sizes of pore shapes and their distributions in the solid in advance.
Keynote Speech 21: Magnetic and optical properties of metal-phthalocyanines

**Speaker:** Dr. Wu Wei, University College London, UK  
**Time:** 10:40-11:10, Thursday Morning, August 22, 2019  
**Location:** Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

**Abstract**
Organic semiconductors based on phthalocyanine molecules have been proven to be a promising material candidate in nano-magnetism, optical devices, and quantum information processing. These organic materials are formed by the one-dimensional molecular chains. In this presentation, I will first discuss recent theoretical and experimental work on the photon-detector devices consisting of copper-phthalocyanines with fast optical response. In addition, I will discuss the magnetic properties of transition-metal phthalocyanines, including copper-, cobalt, chromium-, and lithium-phthalocyanines. We have demonstrated theoretically and experimentally that cobalt-phthalocyanines have a magnetic transition temperature higher than the boiling point of nitrogen, which is very promising for magnetic information storage and spintronics. Theoretically we have also shown that there is a huge potential in magnetism for lithium-phthalocyanines, in which a large exchange interaction arises from the p-orbitals of carbon/nitrogen atoms. The strong anti-ferromagnetic interactions in these molecular chains can be explored for spintronics based on anti-ferromagnetism. By combining copper- and cobalt-phthalocyanines, we can form ferromagnetic chains artificially, leading to organic magnetic meta-materials. Using optical excitations and inter-system crossing, optical control of spin-spin interaction can be realized in molecules, which has a great potential in spintronics and optoelectronics. We can also combine the graphene quantum materials with phthalocyanines to fabricate novel optic-al devices.
Keynote Speech 22: Two-color coherent control of atomic multiphoton ionization with high-order harmonics: Coherent imaging of an attosecond electron wave packet

Speaker: Prof. Abdelkader Makhoute, Moulay Ismail University, Morocco
Time: 11:10-11:40, Thursday Morning, August 22, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
We present a theoretical study of the main characteristics of two-color photoionization spectra obtained when atoms are subjected to an intense radiation pulse containing the fundamental of an infrared laser and one of its higher harmonics. The calculation is performed by numerical integration of the time-dependent Schrodinger equation for a helium, neon and argon atoms. We present the general properties of the spectra and angular distributions as well as the possible occurrence of interferences between the laser-assisted process and above-threshold ionization. Our results indicate that such interference effects, which can lead to partial coherent control of the photoionization process, can be observed at moderate laser intensities within the reach of currently operated laser and harmonic sources. An agreement with the experimental results for neon photoionization has been obtained.

Keynote Speech 23: Phase transition and new functional nano-materials for nanotechnology, biomedicine and energy

Speaker: Dr. Sci. Koledov Victor, Kotelnikov Institute of Radio Engineering and Electronics Russian Academy of Sciences, Russia
Time: 11:40-12:10, Thursday Morning, August 22, 2019
Location: Hua Shan Hall (华山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
In recent decades new functional solid state materials have attracted much attention of material scientists, physicists and engineers. The physical basement of the unique functional properties of the new materials is often associated with phase transitions that manifest themselves in a solid state: magnetic, structural, superconducting ones. The resulting “giant” effects of the striking controlled change of size, shape, entropy, conductivity etc. in these materials under
action of heating/cooling, stress and/or magnetic field exceed by the orders of magnitude the usual
effects of magnetostriction and thermal expansion. These effects provide the new opportunities for
next step engineering, microsystem technology, biomedical technology and alternative energy.
Several new kinds of the solid state functional materials with phase transitions will be described in
the lecture, including magnetic and nonmagnetic shape memory alloys, magnetocaloric materials
based on Heusler alloys and rare Earth elements. The devices based on them and their prospective
applications will also be detailed. Particularly, the new technology of the composite shape memory
mechanical nanotools with record small dimensions and high frequency of operation will be
described. New room temperature applications of the magnetocaloric effect and magnetic functional
materials for solid state refrigerators and heat pumps will be outlined. The new ideas of the
economical high magnetic field generation for electrical engineering, super high speed vacuum
magnetic levitating transportat and medical diagnostics will be discussed. The 10 years’ experience
of the new shape memory dental implant system based on nanostructural shape memory materials for
treatment of the patients with severe dental diseases will also be reported.
Physics Science: Keynote Speech Session 1

Keynote Speech 1: The finite analytic numerical methods for heat conduction and fluid flows in heterogeneous media

Speaker: Prof. Xiaohong Wang, University of Science and Technology of China, China
Time: 08:30-09:10, Wednesday Morning, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
For various problems in engineering, such as steady-state heat conduction in composite materials or steady-state seepage in petroleum industry, it is suitable to describe them with quasi-Laplace equation. For the strong heterogeneous case, it is a challenge and long-standing problem to perform an accurate numerical simulation. We find out that this difficulty is caused by the appearance of the singularity when the conductivity is heterogeneous. A finite analytic numerical scheme is proposed to deal with this problem. Numerical examples show that the proposed numerical scheme makes the convergences much quickly than the traditional methods. Under few grid refinements, such as 2×2 or 3×3 subdivisions for 2D problem and 2×2×2 or 3×3×3 subdivisions for 3D problem, the proposed numerical scheme can provide rather accurate solutions. Especially, the convergent speed of the numerical scheme is independent of the conductivity heterogeneity. In contrast, when using the traditional numerical schemes to simulate the heat conduction or fluid flows in a strong heterogeneous medium, the refinement ratio for the grid cell needs to be increasing dramatically to get an accurate result.
Keynote Speech 2: Mandatory strong links in semiconductor engineering between research, innovation and training in the context of the emergence of the digital society

Speaker: Prof. Olivier Bonnaud, University of Rennes 1, France
Time: 09:10-09:50, Wednesday Morning, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Semiconductor and device physics are the basic knowledge of microelectronic circuits and systems. These components are at the heart of new objects, especially smart and connected objects, which are the main vectors of the Internet of Things (IoT). These IoTs govern the evolution towards a digital society, which should be at the forefront of the future global economy by covering all social sectors (communications, energy, health, etc.). But connected objects include many electronic functions and their design and manufacture become extremely complex due to the diversity of materials, size reduction and digital processing. The challenge today is to ensure that a community of researchers, engineers and recent graduates can share their knowledge and know-how with a broad spectrum that includes semiconductor physics, analog and digital electronics, but also many other skills such as transduction, transmission, energy harvesting, and so on. They must be able to work as a team to create and produce innovative connected objects combining several technologies. This approach is part of the French national coordination strategy for the teaching of microelectronics and nanotechnologies, which manages 12 joint inter-university centers with dedicated platforms for design, technological processes, characterization and testing. The innovative practice proposed to the entire community is developed and covers ULSI electronics but also power electronics, very high frequency and low temperature technologies (large area electronics, plastronics, etc.) including nanometric manufacturing processes in cleanrooms, nano-characterization, and design involving multi-physical approaches. Several examples of practice answering to the needs will be presented and discussed.
Keynote Speech 3: Structural reliability of the InSb infrared focal plane array detector subjected to liquid nitrogen shocking tests

Speaker: Prof. Qingduan Meng, Henan University of Science and Technology, China
Time: 10:00-10:40, Wednesday Morning, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
The typical failure patterns, such as, the local fracture of the InSb chip, the local delamination of the InSb chip, and the local disconnecting of the indium bump array appearing in the InSb infrared focal plane arrays (IRFPAs) detector in liquid nitrogen shocking tests, limit its batch production capacity. Focusing on these problems, we employ theoretical calculation, modeling and simulation, and experimental verification to search the effective approach to solve these problems. Firstly, employing the calculation theory suitable to calculate the thermal stress in the elastic multilayer system, the structural modeling of InSb IRFPAs created with ANSYS and the typical failure distribution characteristics in the InSb IRFPAs, such as the local delamination region and its covering range, the origin of the fracture, the distribution of the cracks, its propagation direction, and its termination location, etc. we will ascertain the local failure mechanism of the InSb IRFPAs in liquid nitrogen shocking tests. Secondly, we assess the effects from the balanced composite structure (BCS) in the InSb IRFPAs assembly, and obtain the suitable structural parameter ranges to eliminate the thermal mismatch stress. These results will significantly improve the mass production capacity of the InSb IRFPAs.

Keynote Speech 4: Super Steep Subthreshold Slope “PN-Body Tied SOI FET” for Ultra Low Power IoT Edge Systems

Speaker: Prof. Jiro Ida, Kanazawa Institute of Technology, Japan
Time: 10:40-11:20, Wednesday Morning, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
We have proposed and demonstrated “PN-Body Tied SOI FET (PNBT)” which shows the super steep subthreshold slope (SS<1mV/dec) over 3 to 5 decades of the drain current with the ultralow drain voltage of 0.1V, at IEDM2015, IEEE S3S 2016, also accepted in IEEE J. EDS 2018. At IEEE EDTM2018, we have also demonstrated the P-channel
PNBT, which will open possibility of realizing the super steep SS CMOS device for ultralow power IoT edge applications. The PNBT will be a near future candidate of steep slope devices, instead of tunnel FETs and negative capacitance FETs. In this talk, I introduce the current status on our PNBT research and also talk about PNBT applying to RF Energy harvesting, where the high efficiency rectification on the ultralow input power below -30dBm is a key technical challenge.

Keynote Speech 5: Polarization Coulomb field scattering in GaN-based HFETs

Speaker: Prof. Zhaojun Lin, Shandong University, China
Time: 11:20-12:00, Wednesday Morning, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Due to inverse piezoelectric effect and device processing, the uneven strain distribution of the barrier layer for GaN-based heterostructure field-effect transistors (GaN-based HFETs) is unavoidable. A new scattering mechanism, the polarization Coulomb field scattering which is related to the uneven strain distribution of the barrier layer, is proposed. This talk introduces the theoretical model of the polarization Coulomb field scattering and the relationship between the polarization Coulomb field scattering and the device structures of GaN-based HFETs. Moreover, the influence of the polarization Coulomb field scattering on the characteristics of GaN-based HFETs are also discussed. Such as, the effect of the polarization Coulomb field scattering on parasitic source access resistance and extrinsic transconductance in AlGaN/GaN HFETs, it is found that the variation of the parasitic source access resistance originates from the polarization Coulomb field scattering, and the effect of the polarization Coulomb field scattering on the parasitic source access resistance is more significant for the device with a longer gate length or a shorter gate-source distance. The behaviors of the measured transconductance for the fabricated AlGaN/GaN HFETs confirm the effect of polarization Coulomb field scattering. In addition, the effects of the polarization Coulomb field scattering on device linearity in AlGaN/GaN HFETs is also found. The single-tone power of the AlGaN/GaN HFETs with different gate widths was measured. A distinct improvement in device linearity was observed in the sample with a larger gate width. The analysis of the variation of the parasitic source access resistance showed that, as the gate bias is increased, the polarization Coulomb field scattering can offset the increased polar optical phonon scattering and improve the device linearity.
Physics Science: Keynote Speech Session 2


Speaker: Prof. Decheng Wan, Shanghai Jiao Tong University, China

Time: 14:00-14:40, Wednesday Afternoon, August 21, 2019

Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
In this presentation, an efficient overset techniques for simulating the complicated viscous flows around ship and ocean structures is introduced. An in-house CFD solver naoe-FOAM-SJTU is developed using the OpenFOAM toolbox which consists of main three special modules of numerical wave tank, 6DOF body motion module and mooring system module. In the numerical wave tank, several wave-makers including piston wave maker, flap wave maker and inlet wave boundary are developed to numerically generate regular waves, irregular waves, directional waves, freak waves, rogue waves, focused waves, etc. An artificial spongy layer is set up at the end of the computation domain to absorb the wave reflection. In the 6DOF body motion module, overset grid method is applied for handling body motion. The main procedure of the overset grid method consists of three steps: projection, hole cutting and fringe-point interpolation. The local body-fit grids are allowed to be arbitrarily embodied into an orthogonal background grid. Therefore the motion of ship and ocean structures in fluid can be treated easily by the overset grid technique without regenerating the mesh. In the mooring system module, three types of mooring lines using taut method, catenary method and piecewise extrapolation method are developed to treat the floating structures. In order to validate the solver, several numerical examples of flows around surface ship (Wigly, KCS, DTMB5415, Catamaran), green water of ship motion in waves, self-propulsion of ship motion, LNG tank sloshing, wave run-up and impact loads on floating platform with mooring system, VIV for risers and VIM for deep-sea platform, as well as wake flows of offshore floating wind turbine are presented.
Keynote Speech 7: Space Magnetism and Superconductivity: Diamagnetic Expulsion, Meissner Effect, Magnetic Pressure and Quantum Trapping Lead to the Origin and Stability of the Saturn Rings

Speaker: Prof. Vladimir Tchernyi (Chernyi), the Modern Science Institute, SAIBR, Russia
Time: 14:40-15:20, Wednesday Afternoon, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract

Many questions still exist about the origin, dynamics, evolution and age of the Saturn rings. Galilei observe rings in 1610. J.C. Maxwell, 1859 proved the rings consist of an infinite number of separated particles. NASA had made four missions to Saturn: Pioneer, Voyager-1 and -2 and Cassini (2004-2017). But still the answer is needed to the question: “After the Cassini grand finale, is there a final consensus on the rings’ origin and age?”

The existing theory of the rings emerging from fragments of an asteroid that came close to the planet. Cassini found no iron and rings consist of 93% of ice and 7% of carbon. To support theory of gravity defragmentation NASA decided to use Titan-sized icy satellite. This theory and others do not confirmed rings existence and particles property.

Also rings could emerge from the particles of a protoplanetary cloud moving on chaotic orbits around Saturn. To shift orbits to the equator necessary introduce an additional force. Existence of Saturn magnetic field and temperature 70-100K bring us to idea of the particles diamagnetism and superconductivity. Solution of electromagnetic problem could be presented as two steps. First, all the chaotic orbits of icy particles are gradually moving to the magnetic equator plane due to diamagnetism and Meissner phenomenon after appearance of Saturn magnetic field. Final picture is similar to iron particles picture that form the same shape around a magnet on a laboratory table. Secondly, because of quantum locking each particle becomes to be locked within three-dimensional magnetic well due to Abrikosov quantum vortex phenomenon for superconductor. And each icy particle is in the stable position, preventing its own horizontal and vertical shift. This mechanism is valid and it works even if particles may have a small fraction of superconductor.

For electromagnetic modeling the magnetization relationships for magnetically uniform spherical particles are introduced as a necessary component to account for dynamics of diamagnetic particles in the gravitational and magnetic fields. The magnetostatics problems of a solitary magnetized sphere and of a spherical particle among identical particles scattered in a disk-like structure are solved. The differential equations of the particles motion in superposition of gravitational force of
attraction and diamagnetic repulsive force can account for the Saturn rings’ stability. The same electromagnetic modeling was made for superconducting particles and it was demonstrated that all particles should come to magnetic equator plane. In both case the main role is playing interaction of the icy particle with the magnetic field of Saturn. Contribution to the rings matter also may come from the frozen water particles generated from the Saturn sputniks geysers due to magnetic coupling between planet and satellites like it happening with satellite Enceladus, and that may even create a new ring. It follows that rings was created in the early time of the magnetic field of Saturn appearance.

Keynote Speech 8: The limits of Riemann solutions to the Euler equations of one-dimensional compressible fluid flow with a source term

Speaker: Prof. Zhiqiang Shao, Fuzhou University, China
Time: 15:20-16:00, Wednesday Afternoon, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
In this talk, we discuss the limits of Riemann solutions to the Euler equations of one-dimensional compressible fluid flow with a Coulomb-like friction as the adiabatic exponent tends to one. Different from the homogeneous equations, the Riemann solutions of the inhomogeneous system are non self-similar. It is rigorously shown that, as the adiabatic exponent tends to one, any two-shock Riemann solution tends to a delta shock solution of the pressureless Euler system with a Coulomb-like friction, and the intermediate density between the two shocks tends to a weighted δ-mesaure which forms the delta shock; while any two-rarefaction-wave Riemann solution tends to a two-contact-discontinuity solution of the pressureless Euler system with a Coulomb-like friction, whose intermediate state between the two contact discontinuities is a vacuum state. Moreover, we also give some numerical results to confirm the theoretical analysis. This is a joint work with Shouqiong Sheng.
Keynote Speech 9: Numerical simulation of laser-induced thrombus formation by Particle method to achieve personalized treatment of laser dermatology

Speaker: Prof. Bin Chen, Xi’an Jiaotong University, China
Time: 16:10-16:50, Wednesday Afternoon, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Port wine stains (PWS) are congenital vascular malformations that progressively darken and thicken with age. Laser therapy is currently the most effective way in clinical practice for PWS. Pulsed dye laser (PDL) with wavelength of 585/595nm is a commonly used treatment for Port Wine Stain birthmarks (PWS). However, deeper components of PWS are often resistant to PDL owing to its short wavelength. Deeper penetrating lasers, including the long pulsed Nd:YAG laser can be used. However, because of its relatively weak absorption by blood, single-pulse Nd:YAG laser requires high energy density to cause effective vessel damage, which may inflict undesirable burning to surrounding collagen. Multi-pulse laser has great potential in clinical treatment because it needs less energy density for each pulse. According to our in vivo experimental study of the transient thermal effects of low-energy multi-pulse Nd:YAG laser on blood vessels, thrombus that completely occludes the vessel lumen is the prerequisite for thread-like appearance, which is the desirable clinical end point. In this work, laser-induced thrombus formation in microvessel was numerically simulated by particle method. Characterized by thrombus that completely occludes the vessel lumen, optimized laser parameters for multi-pulse treatment are recommended for vessels with different diameter and depth including frequency, pulse number, and incident energy in each pulse. In conjunction with laser speckle imaging of skin tissue to detect vessel morphology, intelligentized laser treatment of vascular dermatology can be achieved.
Keynote Speech 10: Long Distance Air Gap Flashovers of High-Voltage Transmission Lines Induced by Wildfires

Speaker: Prof. Fei You, Nanjing Tech University, China
Time: 16:50-17:30, Wednesday Afternoon, August 21, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
Wildfires have incurred flashovers between HVTLS (High-Voltage Transmission Lines) or from HVTLS to ground or even outages of grid at times. The detailed behaviors, properties and key factors of flashovers and fire environments surrounding the right-of-ways (corridors) that usually induce flashovers of HVTLS have been described and recognized, among which altered conditions of HVTLS (metallographic phase, surface morphology, sagging, molten droplets) by wildfires were addressed, and effects of vegetation fuel (amount, type, moisture content and location), topography (steepness), climatic conditions (temperature, humidity, wind speed) on them were investigated. Typical accidents were presented and analyzed to figure out above processes and parameters. Finally, based on above facts and analyses, potential mechanisms of flashovers derived from wildfires to cover super-long distance air gap in dozens of meters were postulated and proposed.

Keynote Speech 11: Effect of ethanol additive within water droplet on impact dynamics and evaporation on a heated surface

Speaker: Prof. Hong Liu, Dalian University of Technology, China
Time: 08:30-09:10, Thursday Morning, August 22, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
The hydrodynamics and evaporation of droplets after impacting the heated red copper surface have been studied experimentally. Apart from the ambient temperature of 18.5 °C, the surface has been heated to 50 °C, 75 °C, 100 °C, respectively. By injecting ethanol with the volume faction of 2%, 4%, 6%, 8% into pure water droplets, the surface wettability which is quantified with the maximum wetting diameter was changed. With the side-view images and bird’s-view-images captured by a high-speed camera, the deformations of mixed droplets
including impact, spread, constriction and oscillation, were observed and compared with the pure water droplet. Thereafter the effect of wettability has been investigated by analyzing the evaporation duration of droplets. Finally it is concluded that preferable wettability will improve the heat transfer from surface to droplets.

Keynote Speech 12: High-fidelity numerical modeling of water wave propagation over coastal area using a viscous flow model

Speaker: Prof. Xizeng Zhao, Zhejiang University, China
Time: 09:10-09:50, Thursday Morning, August 22, 2019
Location: Tai Bai Shan Hall (太白山厅), 1st Floor, Xi’an Grand Dynasty Culture Hotel (西安古都文化大酒店), China

Abstract
The performance of interFoam (a widely used solver within OpenFOAM package) in simulating the water wave propagation and its interaction with ocean structures has been reported to be sensitive to the temporal and spatial resolution. To facilitate more fidelity simulations, a high-fidelity numerical model is built based on a high-order accurate Navier-Stokes model, which employs the VPM (volume-average/point-value multi-moment) scheme as the fluid solver and the THINC/QQ method (THINC method with quadratic surface representation and Gaussian quadrature) for the free-surface capturing. Simulations of regular waves in an intermediate water depth are conducted for the model validation and the results are assessed via comparing with the analytical solutions. The performance of the present model and interFoam solver in simulating the wave propagation is systematically compared in this work. The results clearly demonstrate that compared with interFoam solver, the present model significantly improves the dissipation properties of the propagating wave, where the waveforms as well as the velocity distribution can be substantially maintained while the waves propagating over long distances even with large time steps and coarse grids. Finally, the model is applied to model water wave propagation in super long wave tank and interaction with different coastal structures.
## Materials Science: Technical Session

**Session Chair:**
Hua Shan Hall (华山厅), 1st Floor  
08:30-12:00, Thursday Morning, August 22, 2019

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<td>Prof. Dashan Qin</td>
<td>Hebei University of Technology</td>
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<tr>
<td>Keynote Speech</td>
<td>Development of a Novel Dispersing Agent for Graphene Oxide in Cementitious Materials</td>
<td>Prof. Kung-Chung Hsu</td>
<td>National Taiwan Normal University</td>
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<td>Keynote Speech</td>
<td>Solute Convection on Pore Shape Development in Solid</td>
<td>Prof. Peng-Sheng Wei</td>
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<td>Keynote Speech</td>
<td>Magnetic and optical properties of metal-phthalocyanines</td>
<td>Dr. Wu Wei</td>
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<td>Two-color coherent control of atomic multiphoton ionization with high-order harmonics: Coherent imaging of an attosecond electron wave packet</td>
<td>Prof. Abdelkader Makhoute</td>
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<td>Keynote Speech</td>
<td>Phase transition and new functional nano-materials for nanotechnology, biomedicine and energy</td>
<td>Dr. Sci. Koledov Victor</td>
<td>Kotelnikov Institute of Radio Engineering and Electronics Russian Academy of Sciences</td>
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<td>Oral presentation</td>
<td>Reactions of conjugate addition of nucleophilic reagents with coumarins – a new classes compounds with potential antioxidant activity</td>
<td>Rositca Dimitrova Nikolova</td>
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<td>Reactivity of Platinum Clusters and Isolated Platinum Species of Cerium Dioxide towards CO Oxidation</td>
<td>Georgi Nikolov Vayssilov</td>
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<td>Band Dependent Interlayer f-Electron Hybridization in CeRhIn5</td>
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<td>Observation of Majorana zero mode in the vortex core of high-temperature superconductor (Li0.84Fe0.16)OHFeSe</td>
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<td>Qin Liu</td>
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<td>Characterizations of Hydrogen on TiO2(011)-(2×1) single crystal</td>
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<td>Promising thermoelectric properties and anisotropic electrical and thermal transport</td>
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<td>Yu Li</td>
<td>Shenzhen University</td>
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<td>THERMOELASTIC EQUILIBRIUM AND SUPERFUNCTIONALITY IN PRE-TRANSITIONAL MATERIALS WITH DEFECTS</td>
<td>Oral presentation</td>
<td>Ye-Chuan Xu</td>
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<td>Nano-microstructure and Solidification and of A Hypereutectic Zn-Al Alloy</td>
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<td>Henry Hu</td>
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<td>Preparation of Hf-based ceramic fiber derived from a novel single-source precursor</td>
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<td>Xiaozhou Wang</td>
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<td>Analysis of nonequilibrium transport properties of interacting quantum wire models</td>
<td>Oral presentation</td>
<td>Yangdong Zheng</td>
<td>Mitsubishi Electric (China) Company Limited</td>
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<td>Quasi in-situ Study on Microstructure Evolution of A1 2014 Alloy During thermal deformation and following solution treatment</td>
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<td>Hailong Cao</td>
<td>Chinalco Materials Application Research Institute Co., LTD</td>
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<td>Eccentric behavior of lightweight aggregate concrete encased steel composite columns with H-shaped steel section</td>
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<td>Mostafa M. A. Mostafa</td>
<td>Chang’an University</td>
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<td>Active straining in tuning water splitting</td>
<td>Oral presentation</td>
<td>Kai Yan</td>
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<tr>
<td>Self-supported Ni(OH)2/MnO2 on CFP as a Flexible Anode towards Electrocatalytic Urea Conversion: The Role of Composition on</td>
<td>Poster</td>
<td>Jianfang Meng</td>
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### Activity, Redox States and Reaction Dynamics

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<td>Comparison of optoelectronic properties of NiO films deposited by direct current magnetron sputtering and high power impulse magnetron sputtering</td>
<td>Sheng-Chi Chen</td>
<td>Ming Chi University of Technology</td>
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## Physics Science: Technical Session

Session Chair: Tai Bai Shan Hall (太白山厅), 1st Floor  
08:30-12:00, Thursday Morning, August 22, 2019

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<th>ID</th>
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<td>Effect of ethanol additive within water droplet on impact dynamics and evaporation on a heated surface</td>
<td>Hong Liu</td>
<td>Dalian University of Technology</td>
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<td>High-fidelity numerical modeling of water wave propagation over coastal area using a viscous flow model</td>
<td>Xizeng Zhao</td>
<td>Zhejiang University</td>
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<td></td>
<td>Improvement of Thermoelectric Properties of WSe2 by Substitution in Cationic and Anionic Sublattices</td>
<td>Galina Yakovleva</td>
<td>Nikolaev Institute of Inorganic Chemistry</td>
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<td>Two-stream numerical simulation of a new type drum dryer</td>
<td>Fengjian Chu</td>
<td>Shandong University at Weihai</td>
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<td>Frequency response characteristics of carbon nanotube based nanothermophones</td>
<td>Hanping Hu</td>
<td>University of Science and Technology of China</td>
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<td>Investigation of immersed boundary method for wave-structure interaction using an internal wave marker</td>
<td>Der Chang Lo</td>
<td>National Kaohsiung University of Science and Technology</td>
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<td>Simulation of Capture Process of Tether-Net with Self-Collision</td>
<td>Jiyue Si</td>
<td>Nanjing University of Science and Technology</td>
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<td>Heat transfer of bilayer graphene based on inter-facial rotation and methyl modification</td>
<td>Bing Yang</td>
<td>Jiangsu University</td>
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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: 15-20 Minutes of Oral Presentation
- Keynote Speech: 40-45 Minutes of Keynote Speech

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
Part VI  Hotel Information

About Hotel

The Grand Dynasty Culture Hotel is ideally located in the city center near several major Xi'an attractions. All 464 guestrooms in this Xi'an hotel feature modern amenities including large screen TV's, mini-bars and 24-hour room service. The hotel's restaurant serves a variety of Asian and Western delicacies, and a bar/lounge caters for after dinner drinks. Conference rooms at the business center are equipped with audiovisual facilities as well as all necessary amenities for an efficient office environment away from home. In terms of recreation, the hotel offers a fully-equipped gymnasium and a tennis court for active guests, along with an indoor swimming pool, steam room and sauna for guests seeking something a little more relaxed.

Address: No.172 Lianhu Road, Lianhu District, Xi'an, China

Tel: +86-029-87216868
Website: http://www.gdhxian.com/

How to Get to the Hotel

Xi'an Xianyang International Airport: 34.15km
Xi'an Railway Station: 3.75km
Line 1 Metro Station Sajinqiao: 0.24km

For non-Chinese author, please show the following info to the driver if you take a taxi:

请送我到：陕西省西安市莲湖区莲湖路172号
西安古都文化大酒店
Contact Us

Organizing Committee

Secretary: Ms. Rebecca

Email: wsaugust@126.com

Tel: +86 15527426990

QQ: 1349406763

Wechat: 3025797047