2019 International Conference on Advanced Materials and Applications (AMA 2019)

Conference Programme

http://www.ama2019.org/

Conference organized by

Nuo Yi (诺一) Convention and Exhibition Group

In cooperation with

Ningbo Institute of Materials Technology and Engineering, CAS
Southwest Jiaotong University
Ningbo New Materials Startups Industrial Park
China innovation alliance of new materials industry
Zhejiang University of Science and Technology

2019.04.10-04.13● Ningbo● China

CONTENTS

CONFERENCE MOTIVATION

In 21st century, mankind faces dual challenges of energy distribution and global warming. To reduce the carbon emission to below 2℃ by 2050, we need to reduce our use of fossil fuels (carbon emission) from the current carbon emission level of about 50Gt/year to about 23 Gt/year. To keep the global warming in check, we need to hit 1.5℃ that means to reduce carbon to about 8Gt/year. If no effective measures are taken by the world, according to current policy trajectory, we will reach 70Gt/year carbon emission by 2050. Carbon neutral and/or zero carbon technologies are urgently needed to avert ever increasing draught, flooding, wild fires, etc.

Advanced material is the foundation of new generation of sustainable technologies. With the assistance from computational material science, and nanotechnology derived manipulation, characterization capabilities, a new generation of advanced materials is emerging. Considering the fact that world population is growing, and mineral and ores are dwindling, the focus of our future materials would have to be carbon neutral, sustainable, and multifunctional. Hopefully the surface would be multifaceted to induce much higher functionalities, such as self-adjusting properties, self-adaptable microstructural shifts, the ability to reduce friction, drag, and changing conductivity and even icephobic. Some of properties require multiscale, hierarchical structures to manifest. This new class of materials in general can be referred to as multiscale, multifunctional materials.

In view of this development, it is our sincere wish to organize this new conference on Advanced Materials and Applications to gather forefront researchers around the world to network, and exchange our ideas.

Our conference theme is from Concept to Applications, similar to the translational research term often used in biomedical field. In this conference, we will explore new materials discovery, multiscale multifunctional surface design and fabrication, characterization and testing of new materials, and the potential for new technologies.

CONFERENCE SPEAKERS

Plenary Speakers

Prof. Qunji Xue
Ningbo Institute of Materials Technology and Engineering, CAS, China

Plenary Lecture: TBD
Abstract: TBD

Prof. Stephen M. Hsu
The George Washington University, USA

Biography: Hsu studied boundary lubrication under Prof. Elma Klaus at Pa State University. After graduation, he joined Amoco Chemicals to develop lubricant additives. After 4 years, he joined National Institute of Standards and Technology, a US National Lab. to lead the effort of US Recycled oil equivalency standards. After standards were completed, he led programs in Tribochemistry, Wear of Materials, Advanced Ceramics, and Nanotechnology. In 2009, he joined George Washington University to lead the GW Energy Initiative. His research encompasses lubrication of new materials, tribochemistry, wear maps, friction and wear prediction, and nanolubrication. At GWU, he worked with industries to develop fuel efficient technologies including surface textures, microencapsulation, and coatings. He has published over 250 papers, dozens of books/reports. He has 8 US patents, & 4 world patents. He has given over 60 Plenary Lectures and is Fellows of STLE & ASME, and has over 130 graduated students, postdocs, and visiting professors studying in his laboratory.

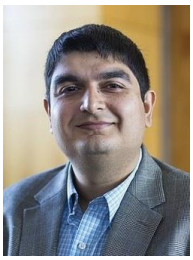
Plenary Lecture: Multiscale, multifunctional surface: an engineering path towards applications
Multiscale multifunctional surface is extending the smart surface concept to active surfaces, which include self-healing and self-repairing. In self-healing, the healing agents and catalysts have to be available nearby to start the healing process. For polymer systems, the agents/catalyst can be embedded into the polymer. For metal systems, the storage of healing agents is a challenge. We have successfully established a low cost surface texturing fabrication process to control friction and interface properties. The fabrication process provides grooves, holes, structures on the surface, to impart surface to reduce friction, but also to hide healing agents at specific depths on the surface. The agents can be encapsulated to preserve functionality. Combining surface texture and microcapsules, we can provide a platform for multiscale, multifunctional architectural design.
Keynote Lecture: Icephobic surface design and measurement technique
The recent opening of the Northern Sea Route during the summer months connecting Pacific Ocean and Atlantic Ocean through the Arctic Sea, has shortened the sea route by 40%. This has prompted the search for ice accretion control on ships sailing through severe stormy conditions. Icephobic surfaces have emerged in the literature. One key challenge is moisture in the air can sublime into ice crystals and adhere to the surface. Once the surface is covered by ice crystals, ice accretion will commence regardless of the surface treatment. Our approach is to reduce the residence time of ice crystals/supercooled droplets to a minimum to prevent ice crystallization from progressing. Meanwhile, there is no standard test method or instrumentation to measure icephobicity of surfaces. We have developed several cryogenic thermal analysis instruments to measure icing delay and ice accretion under seafaring conditions. This allows comparison of various icephobic coatings for potential application to the shipping industry.

Prof. Lei Jiang
Institute of Chemistry, CAS, China

Biography: Lei Jiang received his B.S. degree in solid state physics (1987), and M.S. degree in physical chemistry (1990) from Jilin University in China. From 1992 to 1994, he studied in the University of Tokyo in Japan as a China-Japan joint course Ph.D. student and received his Ph.D. degree from Jilin University of China with Prof. Tiejin Li. Then, he worked as a postdoctoral fellow in Prof. Akira Fujishima's group in the University of Tokyo. In 1996, he worked as researcher in Kanagawa Academy of Sciences and Technology, Prof. Hashimoto's project. In 1999, he joined Institute of Chemistry, Chinese Academy of Sciences (CAS). In 2015, he moved to the Technical Institute of Physics and Chemistry, CAS. Since 2008, he also served as the dean of School of Chemistry and Environment in Beihang University. He was elected as members of the Chinese Academy of Sciences and The World Academy of Sciences in 2009 and 2012. In 2016, he also elected as a foreign member of the US National Academy of Engineering. He has been recognized for his accomplishments with Humboldt Research Award (Germany, 2017), Nikkei Asia Prize (Japan, 2016), MRS Mid-Career Researcher Award (USA, 2014), National Natural Science Award (China, 2005), and many other honors and awards. He has published over 500 papers including 3 papers in Nature, 1 paper in Science, 1 paper in Nature Nanotechnology, 1paper in Nature Reviews Materials, 2 paper in Nature Materials, 7 papers in Natural Communication, 6 papers in Science Advance, 3 papers in Chem. Rev., 8 papers in Chem. Soc. Rev., 7 papers in Acc. Chem. Res., 50 papers in Angew. Chem. Int. Ed., 33 papers in J. Am. Chem. Soc., and 130 papers in Adv. Mater., the works have been cited more than 106,592 times with an H index of 149.

Plenary Lecture: Smart Interfacial Materials with Super-Wettability

Abstract: Learning from nature and based on lotus leaves and fish scale, we developed super-wettability system: superhydrophobic, superoleophobic, superhydrophilic, superoleophilic surfaces in air and superoleophobic, superareophobic, superoleophilic, superareophilic surfaces under water. Further, we fabricated artificial materials with smart switchable super-wettability. The concept was extended into 1D system. Energy conversion systems that based on artificial ion channels have been fabricated. Also, we discovered the spider silk's and cactus's amazing water collection and transportation capability, and based on these nature systems, artificial water collection fibers and oil/water separation system have been designed successfully. We also extended the superwettability system to interfacial chemistry, including basic chemical reactions, crystallization, and nanofabrication arrays.



Prof. Anish Tuteja
University of Michigan, USA

Biography: Anish Tuteja is an Associate Professor of Materials Science and Engineering, Chemical Engineering, and Macromolecular Science and Engineering at the University of Michigan. He received his undergraduate degree in Chemical Engineering (2001) from Panjab University. Tuteja received his Ph.D. (2006) from the department of Chemical Engineering and Materials Science at Michigan State University, working with Prof. Michael E. Mackay. Following his Ph.D., Tuteja started his postdoctoral work on developing superoleophobic surfaces in the labs of Prof. Robert E. Cohen (Chemical Engineering) and Prof. Gareth H. McKinley (Mechanical Engineering) at MIT. He joined the faculty at the University of Michigan in 2009. Professor Tuteja's work has been recognized by several awards including the NSF Career Award and the Air Force Young Investigator award. His work has also led to over 20 patents and patent disclosures. 5 startup companies have been launched to commercialize the research discoveries from his group. His work on developing omniphobic surfaces was named as one of the "Top five new discoveries that will change the world", while the work on oil-water separation was named as one of the "breakthroughs of the year". His

work has also been highlighted by Bloomberg TV, National Public Radio, ABC News, CBC News, Science Podcast, The New York Times, The Washington Post, The Boston Globe and thousands of other news outlets, magazines and newspapers.

Plenary Lecture: Designing Durable Icephobic Surfaces

Ice accretion has a negative impact on critical infrastructure, as well as a range of commercial and residential activities. Icephobic surfaces are defined by an ice adhesion strength tice < 100 kPa. However, the passive removal of ice requires much lower values of tice, such as on airplane wings or power lines (tice < 20 kPa). Such low tice values are scarcely reported, and robust coatings that maintain these low values have not been reported previously. Here we show that, irrespective of material chemistry, by tailoring the crosslink density of different elastomeric coatings, and by enabling interfacial slippage, it is possible to systematically design coatings with extremely low ice-adhesion (tice < 0.2 kPa). These newfound mechanisms allow for the rational design of icephobic coatings with virtually any desired ice adhesion strength. By utilizing these mechanisms, we fabricate extremely durable coatings that maintain tice < 10 kPa after severe mechanical abrasion, acid/base exposure, 100 icing/de-icing cycles, thermal cycling, accelerated corrosion, and exposure to Michigan wintery conditions over several months.

Prof. Marek W. Urban
Clemson University, USA

Biography: Marek W. Urban is currently the J.E. Sirrine Foundation Endowed Chair and Professor of Materials Science and Engineering with a joint appointment in the Department of Chemistry at Clemson University, Clemson, SC. Before joining Clemson in 2013, Marek was a professor of polymer science at USM and NDSU where he directed the Materials Research Science and Engineering (MRSEC) as well as Industry/University Cooperative Research (I/U CRC) Centers funded by the National Science Foundation. Prof.Marek W. Urban works in the field of polymers, polymer spectroscopy, polymeric coatings and films, stimuli-responsive materials, and self-healing polymers.

Plenary Lecture: Designing Self-Healing Materials from Commodity Monomers

Materials with build-in responsive components are outstanding candidates for the development of sustainable technologies. Manifested by the ability to respond to stimuli, these components not only extend materials' lifetime, but also minimize environmental footprint. Among particularly impressive properties of stimuli-responsive materials that recently received significant attention are materials with the ability to self-repair. Last decade efforts have primarily focused in incorporating supramolecular chemistry and reversible covalent bonding in the development of self-healing polymers. This lecture will outline recent advances in self-healing polymers, with the primary focus on the recent advances in the development of commodity self-healable polymers. Inspired by plants, self-healing can be achieved by incorporating viscoelastic responses to their microstructures during their formation, thus enabling deformation upon mechanical damage to close a wound. This can be achieved by introducing multiphase-separated polymers composed of polycaprolactone (PCL-diol), 1,4-butanediol (BDO), hydroxyl terminated spiropyran (SP), and hexamethylene diisocyanate (HDI) precursors copolymerized into a selfhealing polymer.(1) The presence of micro-phase separated fibrous morphologies facilitate repeatable self-healing due to stable interfacial regions between the hard and soft segments of the copolymer, thus enabling of storage of entropic energy upon mechanical damage to be recovered during self-healing. This lecture will provide the framework of van der Waals interactions in acrylic-based copolymers able to self-heal upon mechanical damage.(2) This behavior occurs when the monomer molar ratios are within a relatively narrow compositional range, forming reversible 'key-and-lock" interactions with preferentially alternating copolymer topologies. The unique

self-healing behavior is attributed to favorable inter-chain van der Waals (vdW) forces manifested by the increased cohesive energy densities (CED) forming 'key-andlock' inter-chain junctions, enabling multiple recovery upon mechanical damage without external intervention. The concept of redesigning commodity copolymers without elaborate chemical modifications containing favorable built-in interactions may inspire many technological opportunities for reinventing existing and the development of new generations of sustainable copolymers with controlled chain topologies that survive repetitive damage-repair cycles.

Dr. Anssi Laukkanen
VTT Technical Research Centre of Finland Ltd, Finland

Biography: Dr. Anssi Laukkanen is a Principal Scientist at VTT Technical Research Centre of Finland Ltd., responsible for development of Integrated Computational Materials Engineering solutions employing multiscale and multiphysics modeling. At VTT he is the responsible Principal Investigator for computational material sciences and engineering and the associated strategic scientific spearhead and leading the affiliated research group activities. He acts as the lead developer of the VTT properTune multiscale materials modeling solution and software toolset. His research interests include development of multiscale modeling techniques especially in the micromechanical range, consisting of modeling of single and polycrystal scale phenomena affiliated with deformation and failure behavior of materials. This includes development of hierarchically coupled and concurrent across-scales modeling solutions, focusing on metallic materials, metal based composites and thin films and coatings. Recent efforts have included material discovery and informatics related data centric methodologies and new computing paradigms, including emerging machine learning and artificial intelligence techniques for materials sciences and engineering.

Plenary Lecture: Machine Learning Driven Design of Coatings to Combat Erosion Wear in Wind Turbine Blades

Erosion of wind turbine blades (WTBs) by droplets, hails and other particles like sand is a prevalent problem in the wind power industry. Blade leading edge erosion influences negatively the power output of wind turbines and can lead to costly maintenance and repair operations let alone unscheduled downtime. The design of wear resistant coatings to meet the challenges of ever increasing blade tip speeds and extreme operating environments has proven demanding, and the wear problem still persists. The contribution of current work is in addressing coating design for WTBs by utilizing a machine learning (ML) exploiting design workflow. The idea of the concept relies in merging physical modeling, characterization and experimental results to data-driven ML models to enable the bridging of causal relations from fundamental material characteristics of, for example, a composite material to its performance dominating operating environment. Virtual models are used parallel to experimental results to provide training data to ML models focusing on characteristics such as composite structure, material properties and erosion wear performance in specific wear inducing conditions. The ML models provide a basis for a fast-to-compute high throughput workflow. This enables one to perform thorough optimization and material discovery of coating material solutions to mitigate WTB erosion damage based on the extensive design space of a specific coating material type. Use cases are presented to demonstrate the approach in practice in differing wear environments, based on different fitness metrics and types of wear resistant coating. The results present how data-driven modeling can contribute to wear resistant material design by enriching the capabilities of experimental methods and physics-based modeling workflows in yielding novel and improved material solutions.

Keynote Speakers

Prof. Minhao Zhu
Southwest JiaoTong University, China

Biography:

Keynote Lecture: Damage Mechanisms of Varied Fretting Fatigue Modes
According to the lording direction, the fretting fatigue can be divided into three basic modes: i.e. tension-compression, bending and torsional fretting fatigue. Based on a multi-axis tension-torsion fatigue testing machine platform, the tension-compression, bending and torsional fretting fatigue devices were self-designed respectively, the systematic tension-compression, bending and torsional fretting fatigue tests of 316L austenitic stainless steel, LZ50 steel and 7075 aluminum alloy were carried out on the point contact mode with cylinder/cylinder vertical cross. The fretting fatigue S-N curves were obtained. The various fretting damage zones (partial slip regime (PSR), mixed fretting regime (MFR) and slip regime (SR)) of fretting fatigue samples were analysed comprehensively by optical microscope (OM), scanning electron microscope (SEM), electron energy disperse spectroscopy (EDS), X- ray photoelectron spectrometer (XPS), electron probe microscope analysis (EPMA), transmission electron microscope (TEM) and 3-D white light interferometer. The characteristics of S-N curve, surface damage morphologies, fractographies, crack source locations, crack propagation paths, and crack initiation mechanisms were reviewed systematically. The common features for three various fretting fatigue were outlined and the special phenomena distinguish from others of each mode also has been presented. Two crack initiation mechanisms under various fretting fatigue modes for different metallic materials with different stacking fault energy have been founded.

Dr.Feng Zhou
Lanzhou Institute of Chemical Physics, CAS, China

Keynote Lecture: Control of Wetting, Adhension and Friction
Abstract: TBD

Prof. Zuankai Wang
City University of Hong Kong

Biography: Dr. Zuankai Wang is currently a professor in the Department of Mechanical Engineering at the City University of Hong Kong, and one of the founding members of Young Academy of Science of Hong Kong. Over the past four years, his research group has published 9 papers in Nature/Science Journals. His work has been included in the Guinness Book of World Records, and highlighted in Nature, Nature Physics and many other media coverages. Prof. Wang has received many awards including the 35th World Cultural Council Special Recognition Award (2018), President's Lectureship at City University of Hong Kong (2018, the first Professor to deliver this lecture), Outstanding Research Award (Senior, 2017) and President's Award at the City University of Hong Kong (2017, 2016), Changjiang Chair Professor by Ministry of Education of China

(2016). Outstanding Youth Award conferred by the International Society of Bionic Engineering (2016), OSA Young Scientist Award (2016). The Ph.D. students he supervised have won a number of pretigious awards including Young 1000 Talent Plan (2017, two PHD graduates), MRS Graduate Student Gold Award (2016 Fall Meeting), Hiwin Doctoral Dissertation Award (2016), Hong Kong Young Scientist Award (2015), and MRS Graduate Student Silver Award (2015 Spring Meeting).

Keynote Lecture: Nature-inspired topological surfaces for water and energy nexus: From liquid diode to pancake bouncing

The progress of humankind has been marked by five main waves of innovation. Each wave has transformed our industries and societies, yet is also coupled with the consumption of resources, pollution, and energy/water shortage. In contrast, honed by billion years' evolution, nature has developed extraordinary principles which are characterized with green energy and resilience. This talk focuses on how the design of nature-inspired materials will address the grand challenges facing us such as water and energy.

In particular, I will discuss our recent progress in the exploration of various nature-inspired topological structures for various engineering implementations. I will show that the rational design and control of topological effect, which is generally overlooked in the conventional design, will be able to fundamentally change the solid/liquid interfaces, extend the boundaries of conventional engineering, and spur innovations for various implementations such as thermal management, reversible adhesion, electricity generation, liquid diode-like transport and soft robot (1-7).

Prof. Huawei Chen
Beihang University, China

Biography: Chen Huawei, Professor/Deputy dean of School of Mechanical Engineering and Automation. Dr. Chen graduated from Tokyo Institute of Technology, Japan and worked in Tokyo Institute of Technology and University of Wollongong for several years. His projects were selected as The National Science Fund for Distinguished Young Scholars, Ten Thousand Talents Plan etc. Dr. Chen's research fields include bio-inspired functional surface, micro-nano fluidics and micro-nano fabrication. Dr. Chen has published more than 30 journal papers last 5 years in Nature, Nature Materials, Advanced Materials, Small etc. His work in Nature is also the first paper published in Nature for domestic mechanical engineering of China.

Keynote Lecture: Micro-nano Scale dynamic behavior on hierarchical surface and its surface function mechanism

With high speed development of micro-nano-characterization, and micro-nano fabrication, novel hierarchical structure and surface function have been found in the duration of the natural cognition. Fortunately, creative inspiration can be gotten from nature and it is an effective way to solve the problems of major engineering. Aiming at the important interface problems encountered in the field of aerospace and precise medical treatment such as anti-icing and anti-slipping, systematical characterization on unique natural biological wet surface (tree frog, Nepenthes peristome) were conducted. Their underlying functional mechanisms were investigated to make clear the relationship between hierarchical structure and interfacial liquid film. Novel phenomena of continuous directional liquid spreading, ultrafast liquid transport and uniform liquid spreading were discovered on specific micro-nano hierarchical surface. These novel interfacial liquid adjusting mechanisms result in unique surface function such as the wet-slipping and anti-slipping. The design principle of bio-inspired anti-slipping and slippery surface were proposed. On basis of surface function mechanism of natural biological surface, we developed anti-icing coating for airplane and bio-inspired medical device for precision medicine, whose efficiency were also validated in practical applications.

Prof. Geyu Lu
Jilin University, China

Biography: Lu Geyu, professor and dean of college of electronic science and engineering, Jilin University. In 1985 and 1988, he received his bachelor and master's degree in semiconductor chemistry from the department of electronic science, Jilin university. In 1998, he obtained his Dr. Eng. degree from kyushu university in Japan. From 1988 to 1998, he had worked as research assistant and lecture in department of electronic science, Jilin university. He had served as senior engineering in Yamazaki Company, Japan from 1998 to 2006. He became a full professor of college of electronic science and engineering, Jilin University, in 2006. He is interested in chemical sensors, solar cells as well as oxide semiconductor nanomaterials. So far, he has published more than 300 peer reviewed papers. H-index is 48. He has obtained 1 Japan patent and 25 China patents. He won the first prize of Jilin province natural science (First person, 2017), second prize of science and technology progress in the department of machinery (1997), third prize of national education committee for scientific and technological progress (1991), research significant achievement award of the seventh-five year national science and technology commission (1990), quality improvement excellence award in Yamazaki institute of technology, Japan (2004), top quality award in Tokyo gas company of Japan (2005).

Keynote Lecture: Mixed Potential Gas Sensors Combining Stabilized Zirconia with Sensing Oxide Electrodes

The mixed potential type gas sensor based on yttria-stabilized zirconia (YSZ) as a solid electrolyte and metal oxides as sensing electrode is considered to be a potential device for on-board diagnosis for cars. In order to enhance the sensing performance of mixed potential type gas sensors, the different composite oxide sensing materials with excellent electrochemical catalytic activity, including V, Nb and Ta system, were developed and the high performance triple phase boundary (TPB) was designed and fabricated by various strategies including HF corroding, the double-tape casting, the femtosecond laser direct writing technology and sand blasting technology. This talk is focused on the design and preparation of high performance sensing electrodes and the fabrication of high performance triple phase boundary for mixed potential type gas sensors.

Prof. Liping Wang
Ningbo Institute of Materials Technology and Engineering, CAS, China

Biography: Prof. Liping Wang is the director of Key Laboratory of Marine Materials and Related Technologies, in Chinese Academy of Sciences, and group leader of advanced marine materials and environmental behaviors. He devoted in the research of surface engineering with designed functions, particularly for anti-corrosion and anti-wear purpose. During his academic career period, he received Ten-Thousand Talents Program, Excellent Training Program for Youth Scientists from Chinese Academy of Sciences, Talented Youth Program and Distinguished Young Scholars from the National Natural Science Foundation of China. Dr. Wang published 150 SCI papers with 4000 total citations in materials surface and interfaces area, and also hold over 30 Chinese patents in low-frictions films and anti-corrosion coatings. His research achievement won the 2016 National Technology Invention Award (Rank 1) for his outstanding research work low friction films, working collaboratively with number of high-tech companies.

Keynote Lecture: Hard yet tough nitride-based coatings with anti-bacterial and crack self-healing behaviors

The motivation of this study is to develop an evaluate ceramic coatings, which appear to be the promising solid lubrication and excellent wear resistance at wide temperature range from room temperature to 800 ℃.

At the same time, the coatings have a long effect anti-bacterial and crack self-healing action. The nitride ceramic coatings incorporated with Ag were prepared by arc ion plating at 400 ℃. The hard yes tough coatings with a unique shell-like structure have composed of the discontinuous Ag layer and superhard nitride layer alternately. The ceramic coatings have a thickness of 2-3 mm and hardness of about 40 GPa. The uniaxial micropillar compression tests were carried out to identify the fracture strength, and the result shows the coatings have high fracture strength of 14 GPa. The friction coefficient of the coatings is relatively low, and it is about 0.15 at room temperature and 0.2 at 650 ℃, respectively. It is found the coatings have a good crack self-healing properties by annealing treatment. The mechanism of silver assisted healing of the coatings was revealed by TEM analysis and simulation method. The Ag nanoparticles (AgNPs) would release from the coating by 'micro-channel' and the release rate is determined by the microstructure of the coating. The coatings can release AgNPs at a low concentration and have an excellent anti-bacterial activity.

Prof. Yufei Song
Beijing University of Chemical Technology, China

Biography: Dr. Yu-Fei SONG received his PhD in 2002. After the postdoc research in Leiden University (2002-2004, The Netherlands), Max-Planck Institute of Bio-inorganic Chemistry (2004-2005, Germany), and The University of Glasgow (2005-2008, UK), he joined Beijing University of Chemical Technology (BUCT) in 2008. He is currently holding a full professor position in the State Key Laboratory of Chemical Resource Engineering, BUCT. His research interests mainly focus on developing the polyoxometalates (POMs) and/or layered double hydroxides (LDHs)-based multifunctional materials. He has published over 150 SCI research papers in journals such as Nature Protocol., Nature Commun., Chem. Soc. Rev., Angew. Chem. Int. Ed., J. Am. Chem. Soc., Energy. Environ. Sci., Chem. Sci. etc. He was awarded as Chang Jiang Scholars Program-Young Scholars, Ministry of Education (2015); and National Science Foundation for Distinguished Young Scholars of China (2016).

Keynote Lecture: Layered double hydroxides based materials fabricated by topological transformation strategy and their application in catalysis

Layered double hydroxides (LDHs) are a class of two-dimensional layered materials, with the general formula $[M_{1-x}^{2+}M_x^{3+}(OH)_2]^{x+}[A_{x/n}]^{n-}\cdot mH_2O$, where the main layers are connected by octahedral metal oxide MO_6 and the metal ions are highly dispersed in the layers. LDHs have unique structural characteristics such as controllable size and thickness, topological transformation in the process of structural transformation etc., which endow LDHs a variety of adjustable elements. By taking LDHs as precursors, heterostructured metal oxides or supported highly dispersed metal catalysts, with abundant heterostructures, high dispersion, controllable morphologies, can be prepared through topological transformation in air or reducing atmosphere. In this report, a series of Co-based LDHs were used as precursors to fabricate heterostructured catalysts by topological transformation. The structures of the heterostructured catalysts were carefully characterized, and more importantly, fine tuning of heterostructured interfaces can be achieved by adjusting the calcination temperatures. These heterostructured catalysts have been used in the oxygen evolution reaction, acceptorless dehydrogenative coupling reaction of alcohol and amine, and the photocatalytic activation reaction of methane.

Prof. Dawei Zhang, invited
University of Science & Technology Beijing, China

Biography: Dawei Zhang is a full professor at University of Science and Technology Beijing. He also currently serves as the Vice Secretary General for the Chinese Society for Corrosion and Protection and the International Liaison of Technical Coordination Committee of NACE International. His current research interests include smart coatings

and surfaces, microbiologically influenced corrosion and materials genome engineering. He has published over 80 papers on journals including Nature, Journal of Materials Chemistry A, Corrosion Science and ACS Applied Materials & Interfaces and is currently an Editor of Corrosion Science. He has received several academic awards including Outstanding Young Scientist Award from Chinese Society for Corrosion and Protection, Science and Technology Research Achievements Award from Ministry of Education and was also awarded by the Beijing Nova Program.

Lecture: Multifunctional self-healing protective coatings with improved adhesion properties and corrosion-sensing abilities

Self-healing coatings inspired by biological systems possess the ability to repair physical damage or recover functional performance with minimal or no intervention. This talk will introduce several recent examples of multifuctional self-healing coatings prepared for active and smart corrosion protection. The coatings exhibited both intrinsic and extrinsic self-healing abilities thanks to the shape memory properties of the coating matrix and the inhibitors encapsulated in thermoplastic microspheres, respectively. The composition of the wall surface of the microspheres was tailored to improve their compatibility with the coating matrix and the steel substrate. The coating resin was also modified to demonstrate corrosion-sensing abilities based on metallic ion complexation and local pH variation.

Prof. Guoliang Li, invited
Institute of Process Engineering, CAS, China

Biography: Prof. Guoliang Li completed his PhD degree from National University of Singapore in polymer chemistry in 2011. After postdoctoral research at the Max-Planck Institute of Colloids and Interfaces as an Alexander von Humboldt research fellow (with Prof. Helmuth Möhwald and Prof. Dmitry Shchukin, 2011-2014) and at Kyoto University (with Prof. Susumu Kitagawa, 2014-2015), he joined Institute of Process Engineering of CAS as a Pioneer Hundred Talents Program professor in 2015. His research interests include adaptive polymer chemistry, nanoscience and nanotechnology, marine coatings, sustainable and environment-friendly materials and self-healing materials.

Lecture: Self-Healing Anticorrosion Coatings based on Metal-Organic Framework Nanoparticles

Utilization of self-healing nanocontainers with corrosion inhibitors is an efficient strategy for protecting metals from corrosion. However, self-healing coatings require the rapid release of these corrosion inhibitors to achieve an on-demand barrier on metal surface while avoiding unwanted leakage before the protective coatings are damaged. Zeolitic imidazole framework (ZIF) is an emerging class of functional materials with promising nanostructures and applications in biomedicine and materials science. we present a dynamic protective coating system with self-healing anticorrosion function, based on pH-responsive ZIF nanoparticles. Due to the advantage of high content of corrosion inhibitor in the ZIF nanoparticles and its nature of pH-sensitivity, the ZIF-7 nanoparticles could quickly respond to the surrounding acid environment and release the linker as healing agent, led to a new barrier on scratched metal surfaces.

We also report well-defined ZIF@BTA nanoparticles with approximately 30 wt% benzotriazole inhibitors via a ligand exchange approach. The as-synthesized ZIF@BTA nanoparticles can rapidly release the BTA inhibitor onto scratched areas on metal surfaces, providing 99.4% inhibition efficiency under acidic conditions. Moreover, only limited inhibitor of BTA molecules was leached out (less than 4%) in a neutral environment. Furthermore, the ZIF@BTA nanoparticles were further distributed in the polymer matrix to prepare the self-healing anticorrosion coatings for corrosion resistance enhancement in an acidic environment. Electrochemical impedance spectroscopy (EIS) analysis was utilized to characterize the corrosion resistance.

PROGRAMME OVERVIEW

Date	Time	Programme	Location
April 10, 2019	10:00-21:00	Registration	Lobby
	18:00-18:30	Poster set up	3F, Foyer of Ballroom Hall
April 11, 2019	08:00-08:30	Opening Ceremony	Ballroom1+2
	08:30-10:00	Plenary Lecture Qunji Xue & Stephen M. Hsu	
	10:00-10:45	Group Photo + Coffee Break	
	10:45-11:30	Plenary Lecture Lei Jiang	
	11:30-12:00	Panel Discussion	
	12:00-14:00	Lunch	Café Pacifica
	14:00-16:00	Tribology Session	Ballroom 1
		Sensor Session & Biomimetic Surfaces Session	Tianyi Auditorium
	16:00-16:20	Coffee Break	3F, Foyer of Ballroom Hall
	16:20-18:30	Multifunctional Surfaces Session & Self-healing Materials Session	Ballroom 1
		Biomimetic Surfaces Session	Tianyi Auditorium
	18:30-19:00	Poster Session 1	3F, Foyer of Ballroom Hall
	19:00-20:30	Banquet	Hai Tien Lo
April 12, 2019	08:00-08:10	Opening Ceremony	Ballroom1+2
	08:10-09:40	Plenary Lecture Anish Tuteja & Stephen M. Hsu	
	09:40-10:00	Coffee Break	
	10:00-11:30	Plenary Lecture Marek W. Urban & Anssi Laukkanen	
	11:30-12:00	Panel Discussion	
	12:00-14:00	Lunch	Café Pacifica
	14:00-18:10	Coating Session	Ballroom 1
		Surface Property Measurement and Control Session & Multifunctional materials	Tianyi Auditorium
	18:10-18:30	Poster Session 2	3F, Foyer of Ballroom Hall
April 13, 2019	10:00-12:00	Technical Tour	TBD

TECHNICAL SEESION

Plenary Lecture April 11, 2019, Thursday, Ballroom1+2			
Time	**No.**	**Content**	**Page**
8:30-9:15	P1	TBD ***Qunji Xue***, Ningbo Institute of Materials Technology and Engineering, CAS, China	4
9:15-10:00	P2	Multiscale, multifunctional surface: an engineering path towards applications ***Stephen M. Hsu***, George Washington University, USA	4
10:00-10:45	**Coffee Break**		
10:45-11:30	P3	Smart Interfacial Materials with Super-Wettability ***Lei Jiang***, Institute of Chemistry, CAS	5
11:30-12:00	**Panel discussion/Q&A**		

Tribology Session 14:00-15:55, April 11, 2019, Thursday, Ballroom1			
Time	**No.**	**Content**	**Page**
14:00-14:35	K1	Damage Mechanisms of Varied Fretting Fatigue Modes ***Minhao Zhu,*** Southwest Jiaotong University, China	8
14:35-14:55	A004	The friction and wear behavior of engineered surface topography by pico second laser on PEEK ***Meiling Wang,*** Northwest A&F Univesrity, China	21
14:55-15:15	A023	High Temperature Tribological Properties of TiN Coating Deposited by HiPIMS in Dry Cutting Operation ***Chan Yin Ling,*** National Formosa University, Taiwan	20
15:15-15:35	A043	Improved tribological properties of polyimide reinforced by graphene oxide: A molecular dynamics study ***Jingfu Song,*** Nanjing University of Aeronautics and Astronautics, China	20
15:35-15:55	A1039	Tribological and mechanical properties of MoS_2/WC coating on connecting rod small-end ***Weihuang Liu,*** Ningbo university, China	21
15:55-16:15	**Coffee Break**		

Multifunctional Surfaces Session 16:15-17:40, April 11, 2019, Thursday, Ballroom1			
16:15-16:50	KN	Control of Wetting, Adhension and Friction ***Feng Zhou ,*** Lanzhou Institute of Chemical Physics, CAS, China	8
16:50-17:20	IS	Multifunctional self-healing protective coatings with improved adhesion properties and corrosion-sensing abilities ***Dawei Zhang,*** University of Science & Technology Beijing, China	11
17:20-17:40	A1034	Multifunctional Nanospheres for Treatment of Osteoarthritis ***Tao Sun,*** Tsinghua University, China	21
Self-healing Materials Session **17:40-18:30, April 11, 2019, Thursday, Ballroom1**			
Time	**No.**	**Content**	**Page**
17:40-18:10	IS	Self-Healing Anticorrosion Coatings based on Metal-Organic Framework Nanoparticles ***Guoliang Li,*** Institute of Process Engineering, CAS, China	12
18:10-18:30	A1008	Waterborne Epoxy Coatings for AA 2024-T3: Self-healing capabilities influenced by nature and number of polyelectrolyte layers on microcontainers ***Inime Ime Udoh,*** Institute of Metal Research, Chinese Academy of Sciences, China	22

Poster Presentation 1 18:30-19:00, April 11, 2019, Thursday, 3F, Foyer of Ballroom Hall	
A037	Impact-sliding Wear Behaviors of PVD CrN and WC/C Coatings against Si3N4 Ceramic
A1036	An Improved Friction Model of Elastomer Materials Based on Viscoelastic Rheology
A045	The unusually tribological properties of graphene/antimonene heterojunctions: A first-principles investigation
A047	A novel time-resolved circuit modeling approach of Ti films prepared by high power pulsed magnetron sputtering
A049	Study on the uniformity of TiN films deposited by high-power pulsed magnetron sputtering on the hemispherical workpiece surface
A1013	Zr55Al10Ni5Cu30 amorphous alloy film prepared by magnetron sputtering method
A1027	Research on The Magnetic Control Adhesion Performance of Isotropic Magnetorheological Elastomers
A1035	Surface texture recognition from fingertip skin frictional sensing
A1044	Effect of composition modulation on the structure and optical properties of chromium oxynitride films

A1045	Characterization of Co-P-TiO_2 nanocomposite coatings prepared by pulsed electrodeposition process

Sensor Session

14:00-16:05, April 11, 2019, Thursday, Tianyi Auditorium

Time	No.	Content	Page
14:00-14:35	K5	Mixed Potential Gas Sensors Combining Stabilized Zirconia with Sensing Oxide Electrodes ***Geyu Lu,*** Jilin University, China	10
14:35-15:05	I1	Carbon encapsulated Cu nanohybrid: Sensor to monitor phenolic pollutants and catecholamines ***Naeem Akhtar,*** IRCBM-COMSATS University Islamabad Lahore Campus	22
15:05-15:25	A1023	A novel low concentration water vapor sensor based on composite optical waveguide ***Bin Du,*** State Key Laboratory of NBC Protection for Civilian, China	23
15:25-15:45	A1024	Liquid refractive index sensor based on composite optical waveguide ***Xihui Mu,*** State Key Laboratory of NBC Protection for Civilian, China	23
15:45-16:05	A1028	A flexible pressure sensor based on magnetorheological elastomer with enhanced electrical conductivity and piezoresistive sensing ***Ping-an Yang,*** Chongqing University of Posts and Telecommunications, China	23
16:05-16:20	**Coffee Break**		

Biomimetic Surfaces Session

16:20-19:10, April 11, 2019, Thursday, Tianyi Auditorium

Time	No.	Content	Page
16:20-16:55	K3	Nature-inspired topological surfaces for water and energy nexus: From liquid diode to pancake bouncing ***Zuankai Wang,*** City University of Hong Kong	8
16:55-17:30	K4	Micro-nano Scale dynamic behavior on hierarchical surface and its surface function mechanism ***Huawei Chen,*** Beihang University, China	9
17:30-17:50	A025	Swelling-Induced Chain Stretching Enhances Hydrolytic Degrafting of Hydrophobic Polymer Brushes in Organic Media ***Jian Wang,*** École Polytechnique Fédérale de Lausanne (EPFL), Switzerland	24
17:50-18:10	A039	A dip-decoating process for producing transparent bi-superhydrophobic surfaces for droplet manipulations	24

		Xiaoguang Li, Northwestern Polytechnical University, China	
18:10-18:30	A042	Superamphiphobic Coatings with Polymer-wrapped Particles: Enhancing Water Harvesting ***Youfa Zhang,*** Southeast University, China	25
18:30-18:50	A1032	On-off switchable behaviours for controllable namipulation via oil drive and droplet collection on structured biomimetic surfaces ***Yan Liu,*** State Key Laboratory of NBC Protection for Civilian, China	25
18:50-19:10	A1029	Bioinspired Chiral Supramolecular Hydrogelst ***Chuanliang Feng,*** Shanghai Jiao Tong University, China	26

Plenary Lecture

April 12, 2019, Friday, Ballroom1+2

Time	No.	Content	Page
8:10-8:55	P4	Designing Durable Icephobic Surfaces ***Anish Tuteja,*** University of Michigan, USA	5
8:55-9:40	K6	Icephobic surface design and measurement technique ***Stephen M. Hsu,*** George Washington University, USA	4
9:40-10:00	**Coffee Break**		
10:00-10:45	P5	Designing Self-Healing Materials from Commodity Monomers ***Marek W. Urban,*** Clemson University, USA	6
10:45-11:30	P6	Machine Learning Driven Design of Coatings to Combat Erosion Wear in Wind Turbine Blades ***Anssi Laukkanen,*** VTT Technical Research Centre of Finland Ltd, Finland	6
11:30-12:00	**Panel discussion/Q&A**		

Coating Session

14:00-18:10, April 12, 2019, Friday, Ballroom 1

Time	No.	Content	Page
14:00-14:35	K7	Hard yet tough nitride-based coatings with anti-bacterial and crack self-healing behaviors ***Liping Wang,*** Ningbo Institute of Materials Technology and Engineering, CAS, China	10

14:35-14:55	A046	Nano-structured Ti(CoCr)N films produced by DC magnetron sputtering ***Yantao Li,*** Southwest Jiaotong University, China	26
14:55-15:15	A1037	Tribological properties of GLC and DLC films under ionic liquids lubrication ***Mingming Yan,*** Lanzhou Institute of Chemical Physics, Chinese Academy of Science, China	26
15:15-15:35	A1038	Tribological Studies of Cu-WC-MoS_2 Composite Coatings with Different Contact Loads and Sliding Velocities ***Jun Cao,*** Ningbo university, China	27
15:35-15:55	A1005	Microstructural Characterization of Shrouded Plasma Sprayed Titanium Coatings ***Hong Zhou,*** Waikato institute of technology, New Zealand	27
15:55-16:10	**Coffee Break**		
16:10-16:30	A1040	Microstructure and properties of boride base composite coatings prepared by laser-induced synthesis ***Zhaowei Hu,*** Shanghai Maritime University, China	28
16:30-16:50	A1021	The effect of surface modification of zinc with phosphoric acid on the corrosion resistance ***Long Xu,*** Institute of Metal Research, Chinese Academy of Sciences	28
16:50-18:10	A1031	Layered double hydroxide/poly-dopamine composite coating with surface heparinization on Mg alloy: improved anticorrosion, endothelialization and hemocompatibility ***Feng Peng,*** Shanghai Institute of Ceramics, CAS, China	28

Poster Presentation 2

18:10-18:30, April 12, 2019, Friday, 3F, Foyer of Ballroom Hall

A003	Polysilicon p-i-n Diode and Diode String as High Compatible and Portable ESD Protection Device
A007	Finite element analysis of the effect of skin thickness on pulse condition ups and downs
A008	Biofuncationalized materials microfiber Fabry-Perot Interferometric Sensor
A013	Study on Anti-seepage Slurry of Landfill Site Modified by Sodium Carboxymethyl Cellulose
A026	Influence of Ultraviolet Aging on Adhesion Performance of Warm Mixed Asphalt based on the Surface Free Energy Theory
A032	Comparison of HfO_2 Thin Film Deposited by Thermal ALD and PEALD
A035	Effect of scanning speed on laser remelted Fe-based Ni/WC coatings: interface behaviour and dendrite growth
A1041	The Influence of the Density of CNT Arrays on Their Atomic Oxygen Erosion Effects

Surface Property Measurement & Control Session 14:00-16:05, April 11, 2019, Thursday, Ballroom1			
Time	**No.**	**Content**	**Page**
14:00-14:35	KN	Layered double hydroxides based materials fabricated by topological transformation strategy and their application in catalysis ***Yufei Song,*** Beijing University of Chemical Technology, China	11
14:35-15:05	IS	Magnetic and Photocatalytic Behaviors of Single-Site Distorted Octahedral Iron(III) Oxide-Titania Nanoparticles ***Ganeshraja Ayyakannu Sundaram,*** Dalian Institute of Chemical Physics, CAS, China	29
15:05-15:25	A1009	Synthesis and properties of (Fe,Co,Ni)-Si-Nb-B bulk metallic glasses ***Fang Wang,*** Tianjin University, China	29
15:25-15:45	A1016	Dielectric properties of hyperbranched polyether modified epoxy system for insulating encapsulating application ***Chunmiao Han,*** China Academy of Engineering Physics, China	30
15:45-16:05	A1025	Self-assembled Semiconducting Polymer Dots for Bioimaging and Therapy ***Xuanjun Zhang,*** University of Macau, Macau SAR, China	30
16:05-16:20	**Coffee Break**		
Multifunctional Materials Session **16:20-18:10, April 12, 2019, Friday, Tianyi Auditorium**			
Time	**No.**	**Content**	**Page**
16:20-16:50	I5	Basic red 12 as a highly potent organic material used in analytical chemistry ***Rastislav Serbin,*** Pavol Jozef Šafárik University in Košice, Slovak Republic	30
16:50-17:20	I6	Nanostructured Metal (oxy)nitride Functional Materials ***Minghui Yang,*** Ningbo Institute of Industrial Technology, CAS, China	31
17:20-17:50	A1030	The clinical research status and challenges of biodegradable Mg-based alloys as orthopathetic implants and the latest research progress in SJTU ***Guangyin Yuan,*** Shanghai Jiao Tong University, China	31
17:50-18:10	A1046	The Chemical Vapour Deposition Growth of Graphene: From Theoretical Calculations to Experimental Synthesis ***Qinghong Yuan,*** The University of Queensland, Australia	32
Poster Presentation 2 **18:10-18:30, April 12, 2019, Friday, 3F, Foyer of Ballroom Hall** **See. Page18**			

ABSTRACT

Tribology Session	
No.	**Content**
A004	**Presentation:** The friction and wear behavior of engineered surface topography by pico second laser on PEEK **Presenter:** Meiling Wang **Affiliation:** Northwest A&F Univesrity, China **Abstract:** The majority of exsiting studies on the surface texturing effects on tribologcial behaivor of tribo-systems mainly consists of hard material. And the textures involved are relatviely large in sizes, which are often at a millimter scales or microscales,e.g. several hundreds micronmeters. The aim of this study was to investigate the effect of engineered microstructures on the tribological properties of metal-polyetheretherketone (PEEK) surface with small micro-textures. Circular dimples of 25 μm and 50 μm in diameter were designed and manufactured on PEEK specimens by using pico-second laser. Reciprocating friction and wear tests on a ball-on-flat configuration were performed to evaluate the tribological properties of the designed microstructures in dry contacts. The loading forces of 0.5 N, 0.9 N and 3 N were applied. As a result, obvious fluctuations of coefficient of friction curve were observed in tribosystems consisting of non-textured and textured PEEK with circular dimples of 25 μm in diameter. GCr15 ball/textured PEEK disc specimens with circular dimples of 50 μm in diameter revealed a superior friction and wear property.
A023	**Presentation:** High Temperature Tribological Properties of TiN Coating Deposited by HiPIMS in Dry Cutting Operation **Presenter:** Chan Yin Ling **Affiliation:** National Formosa University, Taiwan **Abstract:** Titanium nitride (TiN) thin film is applied in various applications as it exhibits excellent performance in many aspects. TiN films have been used in machining tools since the mid-sixties. It has been proven to extend tool life. Industrial TiN deposition processes include magnetron sputtering and arc ion plating with individual advantages and disadvantages. This work aims to investigate the tribological properties of TiN thin film deposited by High Power Impulse Magnetron Sputtering (HiPIMS) technology at high temperature. During the cutting process, friction between the cutting tool and surface of workpiece generate a large amount of heat. Oxidation of TiN thin film at around 400℃ high temperature has become the main disadvantage of the thin film as the coating of the cutting tool. The density of epitaxial-grown TiN thin film deposited by HiPIMS is higher than that compared to the columnar thin film deposited DC magnetron sputtering techniques, which may retard the interdiffusions between films and atmosphere. Thus, this paper studies the influences of the microstructure of thin film to the wear resistance at high temperature.
A043	**Presentation:** Improved tribological properties of polyimide reinforced by graphene oxide: A molecular dynamics study **Presenter:** Jingfu Song **Affiliation:** Nanjing University of Aeronautics and Astronautics, China **Abstract:** Polyimide (PI) nanocomposites has been widely applied in industry because of

	excellent comprehensive performance. Its improved mechanical and tribological properties are extensively studied using experimental tests. However, the friction and wear mechanisms of PI nanocomposites still need to be investigated from an atomic view. In this study, the two sandwich friction models of pure PI and graphene oxide/polyimide (GO/PI) nanocomposite in the middle layer sliding against Cu pin are developed using a molecular dynamics (MD) simulation to examine the friction coefficient and wear rate, and verify it by experiments. The MD simulation value of friction reduction and wear resistance improvement of PI reinforced with GO are in qualitative agreement with experimental results. To explore inherent interactions between polymer molecular and metal atoms from an atomic scale, the variations of the radius distribution function (RDF), relative concentrations and velocity of system in the thickness direction are analyzed and discussed. The temperature profiles and energy variations during the friction process are also monitored to reveal the wear mechanisms. This MD simulation study is intended to provide a better understanding on improved wear mechanisms of PI reinforced with GO from an atomic level and inspire future efforts in such area.
A1039	**Presentation:** Tribological and mechanical properties of MoS2/WC coating on connecting rod small-end **Presenter:** Weihuang Liu **Affiliation:** Ningbo university, China **Abstract:** The material of engine connecting rod bushing are normally bearing metals. The coefficients of friction (CoFs) between the surface of bushing and the piston pin is relatively high without lubrication, and the high CoFs will lead to serious wear, fatigue damage and destruction. In order to decrease the CoFs and improve the fatigue life of connecting rod, a self-lubricating coating made by MoS_2/WC is designed and deposited on the surface of connecting rod. The ingredients of coating and processing technologies of the spraying method are introduced. The best ingredient of coating is selected through the frictional experiments, and it is deposited on the surface of connecting rod by the method of liquid spraying. The analysis of stress distribution, deformation and fatigue life of the engine connecting rods are studied. The results show the stress distribution and deformation are decreased and the fatigue life is extended due to the protection of MoS2/WC coating.
Multifunctional Surfaces Session	
A1034	**Presentation:** Multifunctional Nanospheres for Treatment of Osteoarthritis **Presenter:** Tao Sun **Affiliation:** Tsinghua University, China **Abstract:** The development of osteoarthritis is highly associated with the progressive and irreversible destruction of articular cartilage, which is caused by the significantly increased friction at the interface. Here in order to treat osteoarthritis we successfully developed friction-induced drug release nanospheres (NP1) and lubrication-enhanced drug-loaded nanospheres (NP2) based on mesoporous silica nanoparticles. In NP1 the high friction weakened the supramolecular host-guest interaction and therefore caused sustained drug release. Additionally, the drug release behavior was responsive to the applied load and the movement frequency between the tribopairs. In NP2 the hydrated layer surrounding the zwitterionic polymer brushes greatly enhanced lubrication while simultaneously the anti-inflammatory drug was released to achieve local delivery. The in vitro and in vivo experiments revealed that NP2 were biocompatible and effectively inhibited the development of osteoarthritis via up-regulation of anabolic components and down-regulation of catabolic proteases of articular cartilage. The multifunctional nanospheres developed here could be a promising intra-articular nanomedicine

	for the treatment of osteoarthritis.
Self-healing Materials Session	
A1008	**Presentation:** Waterborne Epoxy Coatings for AA 2024-T3: Self-healing capabilities influenced by nature and number of polyelectrolyte layers on microcontainers **Presenter:** Inime Ime Udoh **Affiliation:** Institute of Metal Research, Chinese Academy of Sciences, China **Abstract:** Development of sustainable technological materials with responsive components has intensified in recent years. Stimuli responsive "smart" coatings are among materials investigated for sustainable self-healing capabilities. Here, we report on the effect of nature and number of polyelectrolyte (PE) shells on anticorrosion potential of microcontainers (MCs) applied as pH-sensitive reservoirs in coatings for the protection of AA 2024-T3. Fabrication of "smart" containers with weak-strong (PAH/PSS) and weak-weak (PEI/PAA) polyelectrolyte shells aided self-healing assessment and offered insight into the functionality of the coatings. FTIR and UV measurements confirmed the encapsulation of inhibitor benzotriazole (BTA) in the MCs. Successful deposition of polyelectrolyte shells was confirmed by zeta potential measurements and TEM. Fabricated MCs were pH-sensitive and responded with a release of BTA upon change in pH. Weak-weak polyelectrolyte (W-W PE) shells allowed immediate release of inhibitor, but weak-strong polyelectrolyte (W-S PE) shells encouraged slower, more controlled and prolonged release, leading to immediate and long-term effects on the anticorrosion performance, respectively. Anticorrosion and self-healing assessments were carried out by electrochemical techniques (EIS, SVET) and salt spray corrosion tests. Results reveal that the nature and number of polyelectrolyte multilayers has effect on the self-healing capabilities. These findings may lead to tuneable and controlled self-healing applications.
Sensor Session	
Invited	**Lecture:** Carbon encapsulated Cu nanohybrid: Sensor to monitor phenolic pollutants and catecholamines **Speaker:** Dr. Naeem Akhtar **Affiliation:** IRCBM-COMSATS University Islamabad Lahore Campus **Abstract:** Despite the magnificent advancement in sensing techniques, precise monitoring of phenolic pollutants and catecholamines with high sensitivity and selectivity from real life environmental or biological samples is highly demanded not only to cure but also to diagnose several diseases. Additionally, control monitoring and quantification of these phenolic pollutants and catecholamines from real samples such as commercially available pesticides and urine respectively, is quite challenging because of their low concentration along with excess of co-existing interfering species. To overcome these challenges, herein, for the simultaneous electrochemical monitoring of these phenolic pollutants and catecholamines we fabricated C encapsulated three-dimensional Cu nano-particles through a simple, scalable freeze-drying and carbonization process. The resulting nano-hybrid contains 3D arrangement of controlled Cu nano-particles with atomic arrangement along all four lateral faces with sharp apex which result in exposition of greater fraction of Cu {111} catalytic active sites, large number of sp2 carbon atoms, and maximum surface defects along with dipolar/quadrupolar radiative plasmons, thus offering highly sensitive and selective behavior towards simultaneous monitoring of phenolic

	pollutants and catecholamines even from commercially available insecticide and urine of neuroblastoma patient, respectively. The results demonstrated the potential of the designed electrode not only to use in preventing serious health issue associated with phenolic pollutants but also in diagnosis of suspected catecholamine secreting tumors.
A1023	**Presentation:** A novel low concentration water vapor sensor based on composite optical waveguide **Presenter:** Bin Du **Affiliation:** State Key Laboratory of NBC Protection for Civilian, China **Abstract:** Detection of low concentration water vapor is very important in industry, especially in the production and storage of electronic devices. Composite optical waveguide (COWG) structure is a new type of optical waveguides, it consists of a single-mode planner glass optical waveguide locally overlaid with a thin film. In this paper, a COWG humidity sensor with a water sensitive cladding layer was fabricated and integrated. The sensor was fabricated on a K+ ion-exchanged glass optical waveguide with polyvinylpyrrolidone (PVP) film by using spin coating, and it measured the change of output optical intensity (I) when low concentration humid air at room temperature were injected. The sensor showed higher response to the low concentration water vapor, and the change of COWG sensor's output optical intensity (DI) was found to be proportional to relative humidity ([humidity]) in the range of 10.6~32 %RH (DI = 3.28×10-4[humidity] - 9.499×10-4, R^2 = 0.99747), with response times of less than 20 s. Combining the advantages of optical waveguide and PVP as a sensing material, this design involves an ultrahigh sensitivity and a rapid response/recovery characteristic. Compared with traditional humidity sensors, the PVP covered COWG sensor possessed simple configuration, low-cost, stability. This study demonstrated a promising prospect to make a compact, disposable optical-sensing device with low-cost for humidity sensing application.
A1024	**Presentation:** Liquid refractive index sensor based on composite optical waveguide **Presenter:** Xihui Mu **Affiliation:** State Key Laboratory of NBC Protection for Civilian, China **Abstract:** As a functional film material, TiO_2 film is widely used in photocatalysis, self-cleaning, photoelectric conversion, optics and optical sensors due to its advantages of fixed catalysts and small size and quantum effects of nanomaterial. Composite optical waveguide (COWG) structure is a new type of optical device. This paper demonstrated a liquid refractive index (RI) optical sensor based on composite optical waveguide structure with TiO2 film. Sol-gel technique was selected to prepare TiO_2 sol for its relatively inexpensive manufacturing costs and large area and low-temperature fabrication capability, and TiO_2 film is fixed on the potassium ion-exchanged glass optical waveguide by spin coating method and calcination. The evanescent wave in the composite structure are excited by a wavelength of 632.8nm from a He-Ne laser and the RI sensor with a high sensitivity is obtained. The change of sensor's output light intensity (DI) was found to exhibit a linear response to RI in the range of 1.3374~1.3718 (I= 0.55201RI - 0.73639, R^2= 0.99814), with sucrose solution response times of less than 10 s. This RI sensor possesses the advantages of simple operation, low cost, and high sensitivity, which has considerable application prospects.
A1028	**Presentation:** A flexible pressure sensor based on magnetorheological elastomer with enhanced electrical conductivity and piezoresistive sensing **Presenter:** Ping-an Yang **Affiliation:** Chongqing University of Posts and Telecommunications, China

	Abstract: In this work, the high-length-ratio iron nanowires is used as conductive fillers, polyurethane as matrix. Combined with the classical electronic theory and the growth mechanism of metal fiber, the optimal fillers structural parameters of both aspect ratio and electrical conductivity were obtained. The tensile properties, flexibility of the composite matrix were tested. That help to determine the optimum matrix ratio 15:1. In the experiment, composite materials containing different volume fractions (2%, 4%, 6%, 8%, 10%) of fillers were prepared as sensitive units, and corresponding sensors were developed to build a piezoresistive characteristic test platform. The distribution of iron nanowires is regulated by a magnetic field in the curing of a piezoresistive composite, which to improve piezoresistive performance. By measuring the sensitivity and response time of the sensor under different pressures (5N, 10N), we figure out that the piezoresistive sensing performance is most significant with the content of 4%~6% iron nanowires. Further, applied by the theory of percolation and quantum mechanical tunneling, the experimental results can be explained that reduced the percolation threshold of the filler to obtain the best conductivity. It provides a clearer idea to improve sensing performance while improving hysteresis creep.
Biomimetic Surfaces Session	
A025	**Presentation:** Swelling-Induced Chain Stretching Enhances Hydrolytic Degrafting of Hydrophobic Polymer Brushes in Organic Media **Presenter:** Jian Wang **Affiliation:** École Polytechnique Fédérale de Lausanne (EPFL), Switzerland **Abstract:** Hydrophilic polymer brushes grown via surface-initiated polymerization from silicon oxide surfaces can detach or degraft in aqueous media. Degrafting of these chain end-tethered polymers is believed to involve hydrolysis of bonds at the polymer – substrate interface. Degrafting so far has not been reported for hydrophobic polymer brushes in non-aqueous media. This study has investigated the degrafting and swelling properties of poly (tert-butyl methacrylate) (PtBMA) brushes in different water-miscible, organic solvents, viz. DMF, acetone and THF. In the presence of a sufficient quantity of water in the organic solvent, degrafting was also observed for PtBMA brushes. More importantly, however, the rate of degrafting depended on the nature of the organic solvent and the apparent rate constant of the degrafting reaction was found to correlate with the swelling ratio of the polymer brush in the different solvents. This correlation is first, direct evidence in support of the hypothesis that degrafting is facilitated by a tension that acts on the bond(s) that tether the polymer chains to the surface and which is amplified upon swelling of the polymer brush.
A039	**Presentation:** A dip-decoating process for producing transparent bi-superhydrophobic surfaces for droplet manipulations **Presenter:** Xiaoguang Li **Affiliation:** Northwestern Polytechnical University, China **Abstract:** As mechanical strength is required in most applications using superhydrophobic surfaces, much effort has been applied toward enhancing this property. However, mechanical weakness can also be useful, but little attention has been focused on this seemingly undesirable feature. Here, using a sol-gel SiO_2 coating as a weak surface, a dip-decoating phenomenon is demonstrated to occur when immersing and withdrawing the coating from water. As a result, part of the coating's outer layer of nanoparticles (NPs) is peeled off by shearing motions of the three-phase-line, generating a bi-superhydrophobic surface constructed by adjacent pristine and

	dipped areas, with different colors, adhesive forces and compositional stabilities. Such a Janus surface, which also features ultrahigh transmittance due to antireflection, can be used as a peculiar multifunctional platform for droplet manipulations. The dip-decoating technique also works as a distinctive way for introducing particles onto water surface, in which the density and distribution of peeled NPs can be adjusted by multi-dipping processes. The wrinkled water surface, caused by high NP density, can be used with the Langmuir-Blodgett coating technique and have potential in fundamental studies, such as the evaporation of coated liquids.
A042	**Presentation:** Superamphiphobic Coatings with Polymer-wrapped Particles: Enhancing Water Harvesting **Presenter:** Youfa Zhang **Affiliation:** Southeast University, China **Abstract:** In recent years, water harvesting in arid or semi-arid areas has gained increasing attention. Inspired by the fog harvesting ability of hydrophobic-hydrophilic surfaces associated with Namib desert beetles, considerable effort has been expended in creating such bionic surfaces. However, designing a surface with excellent water harvesting, superamphiphobic, and water/oil self-cleaning properties remains challenging. Herein, an innovative hybrid consisting of a superamphiphobic surface combined with hydrophilic/hydrophobic particles is fabricated by a facile method. This hybrid surface exhibits praiseworthy drop nucleation effect, high removal efficiency, excellent water collection efficiency, and commendable water/oil self-cleaning performance. The surface water/oil wettability, condensation properties, water collection rate and its dependence on the relative humidity and fog flow velocity were systematically investigated. The results obtained strongly indicated that the proposed hybrid superamphiphobic surface enhances the water drop condensation and water collection performance. In fact, the hybrid superamphiphobic surface doped with silicon carbide particles wrapped by an acrylic acid polymer emulsion (SiC@PAA) exhibited better water harvesting effect, with a water collection rate, which more than doubled that of the nano-SiO_2 superamphiphobic surface. And here, this hybrid superamphiphobic surface accomplishes both efficient droplet nucleation and droplet departure, allowing for ~250% increase in the drop number density and ~394% increase in the drop self-removal volumes at the RH of ~80% as compared to the nano-SiO_2 superamphiphobic surface. The findings of this work are considered instrumental to the further design and implementation of hybrid superamphiphobic surfaces for cost-efficient atmospheric water harvesting.
A1032	**Presentation:** On-off switchable behaviours for controllable namipulation via oil drive and droplet collection on structured biomimetic surfaces **Presenter:** Yan Liu **Affiliation:** State Key Laboratory of NBC Protection for Civilian, China **Abstract:** Soft actuators possessing the ability to capture, transport, and be manipulated, has applications in diverse fields. However, facile preparation, rapid actuating, and versatile actions are great challenges in exploring new kinds of soft actuators. In this paper, we presented a facile method to prepare Janus bilayer actuators driven by absorbing oil integrating laser etching and mechanical cutting. This laser etching technic is employed for both rough structures and surface modification, thus, the Janus bilayer film including superhydrophobic and hydrophobic layers was fabricated successfully. By cutting the functional layer at the desired position or by designing various structures, numbers of typical oil-driven soft devices are demonstrated. Furthermore, Janus bilayer actuators with different wettability surfaces exhibited different swelling behaviors, and different media showed different surface extension, thus acting as promising candidates for soft actuators, which also realize the on-off switchable ability between oil/water mixture and ethanol. This study offers a novel insight into the design of soft actuators,

	which may be helpful in developing an oil-driven soft actuator that can be operated as a human finger to manipulate any objects, and extend the stimuli-responsive applications for soft robotics.
A1029	**Presentation:** Bioinspired Chiral Supramolecular Hydrogelst **Presenter:** Chuanliang Feng **Affiliation:** Shanghai Jiao Tong University, China **Abstract:** Chirality is one of life's most distinctive biochemical signatures and has great influence on many biological events, e.g. maintaining normal functions for living cells. How nanofibrous chirality influences cell behaviors in three dimensional (3D) extracellular matrix (ECM) is especially important, since it is only the 3D ECM nanofibrous structure can really mimick the necessary biophysical environment for tissue engineering and helical nanofibrous structure is closely related with the relevant biological events. With the rational design of chemical composition and molecular structures, C2 based surpramolecular gelators can be efficiently self-assemble into two or three dimensional chiral microstructures. The chiral structures with the varied surface composition, mechanical strength, and surface wettability can be constructed and chirality regulated cell adhesion can be obtained in 3D. It is found that left-handed hydrogels can enhance cells adhesion and proliferation, but not for right-handed hydrogels. The study paves a way to explore the influence of chiraity of nanostructures on cell behaviors cell culture in 3D chiral environments and this chiral materials have potential application in the field of tissue engineering.
Coating Session	
A046	**Presentation:** Nano-structured Ti(CoCr)N films produced by DC magnetron sputtering **Presenter:** Yantao Li **Affiliation:** Southwest Jiaotong University, China **Abstract:** TiN thin films have excellent physical and chemical properties, and are widely used as cutting tools, drills, die protective coatings. However, its limited hardness will affect its application in extreme environments, and the columnar structure cross the thin film will lower its corrosion resistance. Hard films with refined grains and nano-structure might be able to solve this problem. In this paper, different concentrations of Co and Cr are doped into TiN film to tailor its structure. The effects of CoCr concentration on the Ti(CoCr)N film structure, mechanical properties, corrosion resistance and Tribological properties were investigated by XRD,SEM, microhardness tester, electrochemical corrosion tester and friction and wear tester. It was found that CoCr doping can disturb the columnar growth of TiN films, and lead to refinement of TiN grains. The hardness of TiN was increased by about 40% at around 31 GPa at the highest CoCr concentration. Compared to TiN films, the corrosion resistance of Ti(CoCr)N films were significantly enhanced. And all Ti(CoCr)N films exhibited better tribological properties than TiN films, and Ti(CoCr)N film with highest CoCr content show the lowest friction coefficient.
A1037	**Presentation:** Tribological properties of GLC and DLC films under ionic liquids lubrication **Presenter:** Mingming Yan **Affiliation:** Lanzhou Institute of Chemical Physics, Chinese Academy of Science, China **Abstract:** Carbon-based coating/ionic liquid composite lubrication system has important application prospects in the aerospace field. The hybridization of carbon plays an important role in the tribological properties of the composite system. In this study, the chromium doped graphite-like carbon (Cr-GLC) and chromium doped diamond-like carbon (Cr-DLC) coatings

	were prepared by PVD and PECVD, respectively. Two kinds of ionic liquids (ILs) were synthesized and evaluated as lubricants for Cr-GLC/steel and Cr-DLC/steel pairs. The results indicated that the friction coefficient of solid/liquid systems have a value of 0.045-0.060, which was reduced approximately 40% compared with the dry conditions. For the solid-liquid composite systems, the tribological performance of Cr-DLC/ILs system is better than Cr-GLC/ILs system. This is mainly due to the lower sp2/sp3 ratio in Cr-DLC coating, which brings better physicochemical absorbing films and mechanical properties. It is worth mentioning that the wear rate of Cr-DLC/ILs system was almost zero with the condition of LB104, while the wear rate of LAB103 is 2.49×10-8 $mm^3/(N•m)$. The reason is LB104 has high corrosion which the anion part can easily absorb and react with friction pair. Furthermore, the large contact angle of LAB103 due to its C=C double bond structure which could influence the formation of physicochemical absorbing film on the interface. SEM and 3D profiler results show that the main wear of Cr-DLC/ILs solid-liquid system is abrasive wear. However, for Cr-GLC/ILs system, in addition to abrasive wear, the coating also undergoes adhesive wear and spalling, which is responsible for the increased wear.
A1038	**Presentation:** Tribological Studies of Cu-WC-MoS2 Composite Coatings with Different Contact Loads and Sliding Velocities **Presenter:** Jun Cao **Affiliation:** Ningbo university, China **Abstract:** The hard and soft alternated composite coatings consist of Cu-WC-MoS_2 are deposited on bearing material matrix. The frictional properties of composite coatings are studied by different contact loads and sliding velocities. The equivalent stress distribution, deformation and local thermal generation of three alternated layers with different coatings thicknesses are shown and discussed. The details of coatings buffer actions and protection mechanisms for bearing substrate are explained. The mechanisms and functions of each soft and hard coating are illustrated. Coating cracks generation and possible extension are shown by deformation analysis. Thermal generation is studied by contact loads, sliding velocities and coating thicknesses. Results show that the soft layer coating decreases frictional coefficient, and hard layer bears heavy load. The sliding velocity and coating thickness are the main influence factors of thermal generation rather than contact load.
A1005	**Presentation:** Microstructural Characterization of Shrouded Plasma Sprayed Titanium Coatings **Presenter:** Hong Zhou **Affiliation:** Waikato institute of technology, New Zealand **Abstract:** Titanium and its alloys are often used for corrosion protection because they are able to offer a high chemical resistance against various corrosive media. In this paper, shrouded plasma spray technology was applied to produce titanium coatings. A solid shroud with an external shrouding gas was used to plasma spray titanium powder feedstock with aim to reduce the oxide content in the as-sprayed coatings. The titanium coatings were assessed by optical microscope, scanning electron microscopy, X-ray diffraction, LECO combustion method and Vickers microhardness testing. The results showed that the presence of the shroud and the external shrouding gas led to a dense microstructure with a low porosity in the as-prayed titanium coatings. The oxygen and nitrogen contents in the titanium coating were kept at a low level due to the shielding effect of the shroud attachment and the external shrouding gas. The dominant phase in the shrouded titanium coatings was mainly composed of α-Ti phase, which was very similar to the titanium feedstock powders. The shrouded plasma sprayed titanium coatings had a Vickers microhardness of 404.2 ±103.2 HV.

A1040	**Presentation:** Microstructure and properties of boride base composite coatings prepared by laser-induced synthesis **Presenter:** Zhaowei Hu **Affiliation:** Shanghai Maritime University, China **Abstract:** The Mo, Cr, B, Ni60 powder were milled and prepared on steel. And the powder was scanned by laser, the boride base composite coating was prepared by laser induced synthesis. The coating samples were analyzed by Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectrometry (EDS) and X-Ray Diffraction (XRD). The analysis show that M_3B_2((Mo, Ni, Cr, Fe)$_3B_2$) and {Fe, Ni} were found in the coating. Hardness was test by Rockwell hardness tester, the average hardness was 1200HV, 2100HV was achieved partly. Electrochemical impedance spectroscopy(EIS) technique was used for the evaluation of the polarization resistance at the coating and base, with the aid of AUTOLAB PGSTAT 302N. Samples were dip in 3.5wt% NaCl solution for 2 hours. The electrochemical technique set as 5mV amplitude and a frequency scan range from 0.01Hz to 105Hz. The FRA impedance and polarization curve show the corrosion resistance of steel was great improved. Dry sliding wear test results show the wear resistance was also improved.
A1021	**Presentation:** The effect of surface modification of zinc with phosphoric acid on the corrosion resistance **Presenter:** Long Xu **Affiliation:** Institute of Metal Research, Chinese Academy of Sciences **Abstract:** As a new type of zinc rich organic coating, cold galvanizing coating has been widely used in automotive industry and electric power due to its convenient construction and good galvanic protection for steel. The zinc particles are highly susceptible to corrosion attack due to their high electrochemical activity, therefore, the protection conferred by these system is limited. In this work, phosphoric acid was chosen to pre-treat zinc plate to reduce its reactivity, thereafter, potentiodynamic polarization and electrochemical impedance spectroscopy were applied to study its corrosion behavior. Pre-treated zinc particles were characterized by Scanning Electron Microscope (SEM) and X-ray diffraction (XRD). Electrochemical impedance spectroscopy (EIS) and Scanning Vibrating Electrode Technique (SVET) were performed to investigate the corrosion protection mechanism of the coating containing pre-treated zinc particles. The electrochemical activity of zinc particles were found decreased largely due to the formation of $Zn_3(PO_4)2•4H_2O$ on the surface of the particle. Little lamellar-shaped phosphate was also observed after surface modification. The best anti-corrosion performance of the coating was achieved when zinc particles modified with 1% phosphoric acid was used. This improvement was accomplished by the combined effect of reduced electrochemical activity of surface modified zinc particles and block effect from lamellar-shaped phosphate.
A1031	**Presentation:** Layered double hydroxide/poly-dopamine composite coating with surface heparinization on Mg alloy: improved anticorrosion, endothelialization and hemocompatibility **Presenter:** Feng Peng **Affiliation:** Shanghai Institute of Ceramics, CAS, China **Abstract:** Magnesium (Mg) and its alloys are promising cardiovascular stents materials for its favourable physical properties and complete degradation in vivo. However, rapid degradation and poor cytocompatibility hinder their clinical applications. To enhance the corrosion resistance and endothelialization of AZ31 alloy, a layered double hydroxide (LDH) / poly-dopamine (PDA) composite coating (LDH/PDA) was successfully fabricated. Polarization curves and electrochemical impedance spectroscopy Nyquist spectrum test proved that the corrosion

	resistance of LDH/PDA sample was significantly improved in vitro. LDH/PDA sample greatly improved the adherence process and proliferation rate of human umbilical vein endothelial cells (HUVECs). After culturing for 10 days, the number of living HUVECs on LDH/PDA sample was comparable to that on Ti sample whereas the cells barely survived on AZ31 or LDH coating. Furthermore, heparin was immobilized on LDH/PDA via the covalent bond (LDH/PDA/HEP). The corrosion resistance and long-term proliferation of HUVECs after introduction of heparin were mildly decreased compared with L/P sample, but were still greatly improved compared with AZ31, LDH coating and PDA coating. Furthermore, the LDH/PDA/HEP sample greatly improved the HUVECs migration rate compared with LDH/PDA sample, and inhibited platelets adhesion which was intense on LDH/PDA sample. Both LDH/PDA and LDH/PDA/HEP samples had low hemolysis rate (2.52% and 0.65%, respectively) in vitro and eliminated the adverse biocompatible effects of the direct PDA coating on AZ31 substrate in vivo. Our results suggest that the LDH/PDA composite coating with further heparinization is a promising method to modify the surface of Mg alloys by significantly improving corrosion resistance, endothelialization and hemocompatibility.
Surface Property Measurement & Control Session	
Invited	**Lecture:** Magnetic and Photocatalytic Behaviors of Single-Site Distorted Octahedral Iron(III) Oxide-Titania Nanoparticles **Presenter:** Dr. Ganeshraja Ayyakannu Sundaram **Affiliation:** Dalian Institute of Chemical Physics, CAS, China **Abstract:** The development of new materials and latest technologies is mainly focused on the improvement of their performances; less concern is inscribed in the development of more ecofriendly and low-cost synthetic procedures. A universal method for preparing distorted octahedral iron(III) oxide surface implanted on titania (FeO_6:TiO_2) nanoparticles (NPs) at first time, which are designed by a novel photochemical method. Different implanting level in FeO_6:TiO_2 NPs are prepared at dosage of visible light in terms of different irradiation times, in which visible light is mediated reduction of $[Fe(bipy)_2Cl_2][FeCl_4]$ precursor complex on TiO_2 NPs surface. In combination with all the conventional techniques, the structure-activity relationships and photochemically formation of single-site FeO_6:TiO_2 NPs mainly explored by electron paramagnetic resonance, ^{57}Fe Mössbauer spectroscopy and X-ray absorption fine structure. Such materials have behaved as soft ferromagnetic character at room temperature. The NPs are soft ferromagnetic, having their hysteresis loops in the range -5 kOe < H < +5 kOe with the specific magnetizations of (2.70 to 23.10) $\times 10^{-3}$ emu g^{-1} at room temperature. However, the magnetic property depends critically on oxygen vacancy, structural defects, chemical states of Fe and content. This strategy provides an alternative route to synthesize nanosized phase pure anatase x%FeO_6:TiO_2 NPs showing room temperature ferromagnetism. This work is expected to open up a general method for the synthesis of other transition-metal-surface implanted-metal oxide semiconductor with magnetic behavior.
A1009	**Presentation:** Synthesis and properties of (Fe,Co,Ni)-Si-Nb-B bulk metallic glasses **Presenter:** Fang Wang **Affiliation:** Tianjin University, China **Abstract:** Fe-based bulk metallic glasses are attractive materials for engineering application due to the excellent soft magnetic properties, ultra-high mechanical strength and cost efficiency. In this paper, the influence of Co and Ni replacement for Fe in Fe-Si-Nb-B glassy alloys was demonstrated to improve the Glass-forming ability (GFA), thermal stability, mechanical properties and corrosion resistance. Moreover, it was found that Co and Ni equiatomic

	replacement for Fe can effectively broaden the supercooled liquid region, therefore, as a consequence, the glassy rods of (Fe0.5Co0.5)73Si3Nb4B20 in 3.5 mm diameter and (Fe0.334Co0.333Ni0.333)73Si3Nb4B20 in 2 mm diameter were successfully prepared by copper mold casting with enhanced GFA. Remarkably, the (Fe0.5Co0.5)73-75Si3Nb4B18-20 glassy alloy exhibited excellent soft magnetic properties with saturation magnetization (Bs) above 1.2 T, and combination coercivity (Hc) of about 5A/m. In addition, the (Fe,Co)-Si-Nb-B and (Fe,Co,Ni)-Si-Nb-B glassy alloys also exhibited high corrosion resistance and bending ductility, which is promising for further development of amorphous alloys as practical soft magnetic materials.
A1016	**Presentation:** Dielectric properties of hyperbranched polyether modified epoxy system for insulating encapsulating application **Presenter:** Chunmiao Han **Affiliation:** China Academy of Engineering Physics, China **Abstract:** Hydroxyl terminated aliphatic hyperbranched polyether (HBPO) was proved by our previous research as an excellent toughener for epoxy, which could both enhance and toughen the system with no decrease on thermal property. But, for evaluating HBPO's applicability on insulating encapsulating epoxy, the system's dielectric properties after incorporation of HBPO with primary porous structures must be investigated. In this paper, two kinds of epoxy system were prepared with different curing agents under optimum HBPO content. Samples' breakdown strength, volume resistivity, dielectric constant and dielectric loss factor were tested. The results showed that the incorporation of HBPO brought little effect on epoxy's dielectric properties. The modified system still possessed well dielectric properties, such as breakdown strength 34kV/mm, dielectric constant 2.89, dielectric loss factor 0.0025, volume resistivity 7.0E+14ohm•m(22℃, 1min). Epoxy with the above dielectric properties was surely competent for insulating encapsulating application. It also meant HBPO was suitable for application in this field.
A1025	**Presentation:** Self-assembled Semiconducting Polymer Dots for Bioimaging and Therapy **Presenter:** Xuanjun Zhang **Affiliation:** University of Macau, Macau SAR, China **Abstract:** Semiconducting polymer nanoparticles (Pdots) are a new class of fluorescent nanoprobes for biomedical applications with low toxicity, ultrabright emission, and tunable photophysical properties. While this type of nanoprobe is promising, there are several challenges for practical applications. For in vivo applications, emission in the Near-Infrared (NIR) is desirable but the serious self-quenching of NIR emitters in the solid state or aggregation is a bottleneck for practical imaging. We resolved this problem by cascade energy transfer strategy and prepared a series of self-assembled multicomponent Pdots. The products showed high fluorescence quantum yields (>30%) with average per-particle brightness at least 3 times larger than that of the commercially available quantum dots.1 We have recently developed an efficient self-assembly strategy to load Pdots into liposomes, which act as nanoreactors for in situ photocatalytic hydrogen production. The generated hydrogen molecules can diffuse across the lipid bilayer of liposome to counteract ROS overexpressed in diseased tissues.2 This promising technique has great potential for reducing oxidative damage in injured tissue.
Multifunctional Materials Session	
Invited	**Lecture:** Basic red 12 as a highly potent organic material used in analytical chemistry **Presenter:** Dr. Rastislav Serbin **Affiliation:** Pavol Jozef Šafárik University in Košice, Slovak Republic

	Abstract: Basic red 12 (BR12) 1,3,3 – trimethyl – 2 - [3 - (1,3,3-trimethyl-1,3-dihydroindol -2 - yliden) -propyl1,3-dienyl]-3H-indolium chloride is an organic agent belonging to the organic basic dyes. It's commonly used in textile industry. At our department we showed other potential of this dye. BR12 is highly potent analytical agent for determination of some very important analytes (f. e. diclofenac, some surfactants, Au, Pd, Pt and other). Best results were achieved by speciation and determination of platinum. It is known that Pt usually occurs in aqueous solutions in the form of anions, mostly the chloride acid complexes $[PtCl_6]^{2-}$ and $[PtCl_4]^{2-}$, which differ in reaction activity. This allows the use of a polymethine agent BR12 in order to make such anions extractable as ion associate (IA). Relevant IA are highly effective analytical tools for AAS speciation of microamounts of platinum. The principles of the developed method for Pt speciation are the different conditions needed for the formation and extraction of Pt(IV) and Pt(II) ion associates with SCN^- and BR12 agent. The conditions found for IA formation and extraction have enabled the proposing of a new Pt(II) and Pt(IV) speciation process. These species can be reliably determined simultaneously at concentration ratios from 1:5 to 5:1. Moreover, the IA of platinum with BR12 can be extracted with toluene up to a volume ratio of aqueous and organic phases of $V_{aq}:V_{org}$ = 50:1. This fact for Pt determination means decreasing the limit of detection from 7.1 μg L^{-1} to 0.3 μg L^{-1}. The method was applied for Pt determination in a model and real samples.
Invited	**Lecture:** Self-assembled Semiconducting Polymer Dots for Bioimaging and Therapy **Presenter:** Prof. Minghui Yang **Affiliation:** Ningbo Institute of Industrial Technology (CNITECH), CAS, China **Abstract:** Metal oxynitrides have shown prodigious potential in many fields including photocatalytic water splitting, optical detection and electrochemical applications. This is due to the physical and chemical properties of oxynitrides that can be easily tuned by varying their nitrogen and oxygen contents. Here we present series of our investigations on metal oxynitrides, from crystal structure studies to their applications. The works shown here include the crystal structure and anion ordering studies of metal oxynitrides as well as a simple process for preparing mesoporous transition metal nitrides without the use of nano-patterning or other template. Furthermore, these materials show remarkable properties for the fields of clean energy and sensing applications.
A1030	**Presentation:** The clinical research status and challenges of biodegradable Mg-based alloys as orthopathetic implants and the latest research progress in SJTU **Presenter:** Guangyin Yuan **Affiliation:** Shanghai Jiao Tong University, China **Abstract:** Being biocompatible and biodegradable, magnesium alloys are considered as the promising biomedical degradable implant materials, such as for bone fixtures, plates and screws, which would avoid secondary surgeries to remove after the tissue healed. The challenges for the current commercial Mg alloys as biomaterials are the serious localized corrosion behavior, poor bio-safety and low mechanical properties. Requirements for biodegradable implants are good biocompatibility, controlled biodegradability and sustainable mechanical properties. To solve these issues, scientific composition design and microstructure regulation as well as fabrication process with high purity should be systematically considered and adopted. Aided with the first principle calculation, novel biodegradable Mg alloys JDBM series have been designed and developed in recent years. The patented JDBM alloys exhibit the favorable uniform corrosion degradation behavior and degradation controllability. In this talk, the alloy design strategy, microstructure, mechanical properties and degradation behavior will be introduced. The in vitro and in vivo experimental results of JDBM alloy as bone implants will be evaluated. The primary

	results show that the JDBM alloy has a promising clinical application prospect.
A1046	**Presentation:** The Chemical Vapour Deposition Growth of Graphene: From Theoretical Calculations to Experimental Synthesis **Presenter:** Qinghong Yuan **Affiliation:** The University of Queensland, Australia **Abstract:** High quality low-dimensional carbon materials, such as single-crystalline graphene, is highly desired for both fundamental research and their industrial applications. While their controllable synthesis has been a great challenge due to the extremely large number of combinations of experimental parameters and the lack of understanding of the growth mechanism. Using the first-principles theoretical DFT calculations, we systematically explored the growth mechanism of graphene and have successfully revealed the fundamental understanding of graphene nucleation, growth kinetics on the catalyst surface and the epitaxy growth. Based on our theoretical results, the routes towards the controllable synthesis of the desired carbon materials are proposed and achieved via experimental collaborations.

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