The Golden Academy Conference Series

2022 International Symposium for Advanced Materials Research (ISAMR 2022)

June 28 - June 30 2022

Conference Proceedings

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ASIA PACIFIC SOCIETY FOR MATERIALS RESEARCH

GOLDEN ACADEMY

Message from the organizers

Dear Colleagues and Friends,

We would like to invite all of you to join the 2022 International Symposium for Advanced Materials Research (ISAMR 2022), which will be held during June 28-June 30 2022.

The conference is intended to serve as an interdisciplinary platform for the exchange and networking between top scientists, experienced engineers, frontier researchers, and students across a wide spectrum of research fields.

Your active participation and discussion is the key to the success of this conference.

Yours Sincerely,

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Asia Pacific Society for Materials Science (APSMR)
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Conference topics

1. Structure materials and Functional Coatings (metals, ceramics, and composites)
2. Materials for energy (saving, conversion, transfer, storage) and environment plus electrochemistry
2.1. Photovoltaics
2.2. Batteries and Fuel Cells
2.3. Materials for Thermal Management and Thermal Energy Utilization
2.4. Materials for Energy and Environmental Applications
3. Optics and Photonic Materials
4. Electronic, Magnetic and Nanomaterials
5. Polymer Science and Molecular Chemistry
6. Organic Materials and Bio-materials
7. Materials Characterization and Computational Modeling

Beijing/Singapore /Taipei /Hong Kong	Tokyo/Seoul	TUE, 06/28	WED, 06/29	THUR, 06/30
9:30-11:30	10:30-12:30		Oral Presentation	
11:30-13:00	12:30-14:00	Lunch Break		
13:00-16:00	14:00-17:00	Oral Presentation		

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Presentation List

Beijing/Singapore /Taipei /Hong Kong	Tokyo/Seoul	TUE, 06/28	WED, 06/29	THUR, 06/30
9:30-11:30	10:30-12:30		7. R. ADHIKARI 8. K.I. LEE 9. S. HAYASHI & S. UCHIDA 10. H. YAMANE	17. Y. SHIRATSUCHI 18. Y. YASUKAWA 19. Z. SBEAH 20. R. WU
11:30-13:00	12:30-14:00	Lunch Break		
13:00-16:00	14:00-17:00	1. D.S. TSAI 2. C.L. LIN 3. S.C. HSU 4. Z.E. SHI 5. C.H. CHUANG 6. P.K. YANG	11. T. KOSHIMIZU 12. M. TATENO 13. L. ZHANG 14. Y.K. SHEN 15. S. NIWAYAMA 16. L. WU	

GOLDEN ACADEMY

TUESDAY 06/28

1. Nanomaterial-based photodetectors for use in harsh environments (D.S. TSAI)
2. Preparation and characterization of platinum nanoparticles supported on silica-carbon black nanocomposites for methanol oxidation reaction (C.L. LIN)
3. The synergistic effect of doping and surface modification on Li4Ti5O12 microspheres and their application in high-rate anode material for lithium ion battery (S.C. HSU)
4. Investigation on additive engineering for stable and efficient organohalide lead perovskite photovoltaics (Z.E. SHI)
5. Nano-chemical mapping of cobalt nanoparticles on the graphene-related membranes (C.H. CHUANG)
6. Future healthcare & enabling technology - A sustainable approach (P.K. YANG)

WEDNESDAY 06/29

7. A Compact and sensitive metal – dielectric – metal waveguide-cavity structure as refractive index sensor (R. ADHIKARI)
8. TBA (K.I. LEE)
9. Investigation of laser wireless power transmission under seawater (S. HAYASHI & S. UCHIDA)
10. Magneto-plasmonics on perpendicular magnetic nanostructures for chemical sensing applications (H. YAMANE)

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11. Dependence of bonding strength on interface edge shape (T. KOSHIMIZU)
12. Examination of bonding method for improvement of strength of ceramics to metal joint (M. TATENO)
13. Microstructure and mechanical properties of a 0.1C5Mn3Al dual phase Steel (L. ZHANG)
14. Development of a PCL/graphene scaffold for supporting osteogenesis process (Y.K. SHEN)
15. Practical selective monohydrolysis of symmetric diesters and applications (S. NIWAYAMA)
16. TBA (L. WU)

THURSDAY 06/30

17. Anomalous Hall effect at Pt/Cr2O3 interface (Y. SHIRATSUCHI)
18. Ferrite materials for super-high-frequency band applications (Y. YASUKAWA)
19. GST based plasmonic biosensor for hemoglobin and urine detection (Z. SBEAH)
20. TBA (R. WU)

Conference Presentation Abstracts

GOLDEN ACADEMY

Tue/06/28

Abstract ID: 1

Nanomaterial-based photodetectors for use in harsh environments

Dung-Sheng TSAI, Chung Yuan Christian University, Taiwan

Photodetectors (PDs) are the most important part of optical devices in enabling 5G communication systems. To increase the available capacity of the 5G network, more equipment is deployed in harsh environments such as basements, rooftops, deserts, forests, spaces, and underground mining. Therefore, next-generation PDs should be designed for these extreme conditions (high/low temperatures, high radiation, big shock, and chemically corrosive environments). Nanomaterials such as 2D nanomaterials, nanorods, and nanosized thin films have been attempted to constitute PDs with high performance for harsh environment applications.

Here, we will introduce our research results, including SiC, MoS2, AlN, Ga2O3, and MoS2/green graphene heterojunction based PDs for high-temperature and high-radiation photodetection. The primary objective of this report is to provide a brief review of our research status and future development direction of nanomaterial-based PDs for use in harsh environments.

Notes

GOLDEN ACADEMY

Tue/06/28

Abstract ID: 2

Preparation and characterization of platinum nanoparticles supported on silica-carbon black nanocomposites for methanol oxidation reaction

Cheng-Lan LIN, Tamkang University, Taiwan

Electrocatalysts composed of platinum nanoparticles supported on silica-carbon black nanocomposites (Pt/SiO2-C) for methanol oxidation reaction (MOR) are prepared and characterized in this study. Silica nanoparticles are synthesized by the sol-gel method on Vulcan XC-72 carbon black surface to form SiO2/C composites. Pt nanoparticles are then decorated onto the composites using the polyol method to obtain Pt-SiO2/C electrocatalysts. Electrocatalysts with SiO2/C weight ratio of 2/98 to 12/88 are prepared, and the Pt loading of the electrocatalysts is measured using inductively coupled plasma-optical emission spectroscopy to be ~20 wt%. The average diameter of the Pt nanoparticles is about 3 nm, as estimated from transmittance electron microscope images. Electrochemical properties and MOR performances of the electrocatalysts are investigated using cyclic voltammetry, chronoamperometry, and CO-stripping voltammetry. The results indicated that Pt/SiO2-C electrocatalysts have superior MOR catalytic activity, more negative surface-absorbed CO oxidation onset potential, averagely larger electrochemical active surface area, and better stability than a commercial E-TEK Pt/C electrocatalyst. Electrochemical impedance spectroscopy analysis showed that the Pt/SiO2-C electrocatalyst with the SiO2/C weight ratio of 8/92 has comparable charge transfer resistance as the commercial E-TEK PtRu/C electrocatalyst and suggested that the bi-functional mechanism might be responsible for the enhanced MOR performance. It is envisioned that the Pt/SiO2-C might serve as a new potential candidate for the MOR electrocatalyst for the direct methanol fuel cell.

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Tue/06/28

Abstract ID: 3

The synergistic effect of doping and surface modification on Li4Ti5O12 microspheres and their application in high-rate anode material for lithium ion battery

Shih-Chieh HSU, Tamkang University, Taiwan

Mg^{2+} & Cr^{3+} co-doped and phosphidated $Li_4Ti_5O_{12}$ (LTO) microspheres have been prepared by spray-drying method, aiming to significantly enhance its rate performance of LTO. Our results indicate that both the Mg^{2+} & Cr^{3+} doping can improve the electronic conduction of LTO due to the partial reduction of Ti^{4+} (from Ti^{4+} to Ti^{3+}) and narrowing of the band gap, respectively. Moreover, the phosphidation process also can form an uniform conductive glass layer on the LTO surface leading to higher ionic conductivity. As a result, the modified LTO exhibits an improved rate capability and cyclic stability compared with the pristine LTO. Particularly, the Mg^{2+} & Cr^{3+} co-doped and phosphidated LTO reveals the best performance due to the combinatorial effects of ion doping and interfacial modification. Finally, the capacity can be significantly improved, especially at high C rates (127.72 mAh/g at 20 C which is 77.6% of the value recorded at 0.1 C (164.62 mAh/g)) due to the dual effect of the better electric and ionic conductivities.

Keyword: Li4Ti5O12, Anode material, Lithium ion battery, Spray drying, Doping, Phosphidation

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Tue/06/28

Abstract ID: 4

Investigation on additive engineering for stable and efficient organohalide lead perovskite photovoltaics

Zhong-En SHI, Yuan-Hsiang YU, Fu Jen Catholic University; Chih-Ping CHEN, Ming Chi University of Technology, Taiwan

The past decade has witnessed the breakthrough of photovoltaic properties of perovskite solar cells (PSCs) at the laboratory scale. In recent certified reports, the power conversion efficiency (PCE) of PSCs has exceeded 25%. Unfortunately, defects originating from the crystallization process can cause energy loss, negatively weakening the performance and stability of the devices.

In first part of our research, passivation of defects was successfully achieved through the use of additive engineering with multifunctional ligand, 6,6'-dithiodinicotinic acid (dtdn) and The functional reactive sites on dtdn can interact with perovskite components, minimizing non-radiative recombination by suppression of defect states, thereby improving the charge transport and reducing the energy loss. In addition, urea has been demonstrated to control the formation of grains with enlarged perovskite crystals in previous reports. Therefore, we investigated the effect of combining the two additives. Urea improve the crystal size and dtdn passivate the defects dominantly. As the result, the PCE of the PSCs incorporating dtdn increased from 16.76% to 18.34%, with enhancements in the values of JSC and VOC. More importantly, with the combinational effect of urea and dtdn, we realized the PCE as high as 20.64% and excellent air-stability.

In the second part, a novel reduced graphene oxide-Cysteine/nanogold (RGO-CysAu) hybrid material was incorporated into the perovskite precursor for fabrication of inverted perovskite devices. The addition of RGO-CysAu result in improved crystalline quality by retarding the crystallization rate, and decreased defect density by passivating non-recombination centers inside perovskite. Moreover, incorporation of RGO-CysAu reduced the resistance of the internal charge transfer, which is beneficial for carrier movement in perovskite active layer. Consequently, an optimized device with a maximum PCE of 20.59% was achieved due to an improvement in JSC from 21.69 to 23.89 mA/cm2.

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Tue/06/28

Abstract ID: 5

Nano-chemical mapping of cobalt nanoparticles on the graphene-related membranes

Cheng-Hao CHUANG, Tamkang University, Taiwan; Takuji OHIGASHI, Institute for Molecular Science, Japan; Yi-Ying CHIN, National Chung Cheng University, Taiwan; Juan J. VELASCO-VELEZ, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Germany; Meng-Hsua TSAI, Russell CLEMENTE, Tamkang University; Wei-Hao HSU, Academia Sinica; Way-Faung PONG, Tamkang University, Taiwan

Graphene sheet is considered as one of important 2D materials due to the unique electric transfer property and thinnest thickness. The ability to grow the functional nanomaterials on the top of graphene substrate has been proposed due to the ideal single-atom thickness, excellent electrical conductivity, transparent electrode, flexible nanosheet, and stable structure of graphene-based materials. Cobalt oxides as one of active electrocatalysts has been proven to be one class of HER/OER in alkaline environment. The facial functional groups (hydroxyl, carboxyl, and epoxide) of nanocomposite synthesis are characteristic for the interesting interaction with metal site. By the strong covalent bonding between O and Co, the oxidation state of Co^{3+} in Co_3O_4 can be partially reduced to Co^{2+} state among individual Co_3O_4 nanocrystal/graphene. Since the nano-scaled microscopic probing is still absent for the detail and direct observation, we will demonstrate the element-specific chemical images in Scanning Transmission X-ray Microscopy, to promote the graphene-related electrode for the future liquid-cell applications. Our work will also provide the reduced graphene oxide membrane as the electrochemical window materials used the liquid cell, in order to demonstrate the modification of interface property of Co and its HER performance.

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Tue/06/28

Abstract ID: 6

Future healthcare & enabling technology - A sustainable approach

Po-Kang YANG, National Central University, Taiwan

With the rise of Internet of Things (IoT) and sensor network, the personalized healthcare electronic system possessing multi-modality and multi-functionality has received great attentions. However, with the increased demand of complex device design, power supply from traditional batteries have also encountered great challenges. Therefore, it is essential to discover an alternative energy strategy, which is sustainable, pollution-free, highly sustainable to meet up with advanced healthcare device/system applications. Nanogenerators (NGs), by converting ambient energy from the environment into electricity, have been proposed as an effective and stable approach for future healthcare electronics very recently. In this presentation, we will introduce the progress of healthcare electronics incorporated with NGs, including material selection, design principle, and system integration.

Notes

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Wed/06/29

Abstract ID: 7

A Compact and sensitive metal – dielectric – metal waveguide-cavity structure as refractive index sensor

Rammani ADHIKARI, Zen SBEAH, Diksha CHAUHAN, Ram Prakash DWIVEDI, Shoolini University, India

Herein, we design a sensing structure having a metal-insulator-metal waveguide and a Pi-shape cavity tangent on the main waveguide which work in the visible to near-infrared regions. The tunability of the design has been explored based on the structural parameters like length of the branches, height of the device, radius of the nanorods, and the material under sense. The results revealed that the proposed architecture produces two modes of operations. With the first mode, the optimum sensitivity achieved is 820 nm/RIU and it is achieved at 1320 nm/RIU in the second mode for Pi-structure only. The introduction of nanorods on the top branch has increased the level of sensitivity value to 1520 nm/RIU. The sensor design is simple in construction, possesses better sensing features, and is small in size. Thus, the proposed plasmonic sensor is relevant for lab-on-chip biochemical detection (having an optical refractive index between 1.2 – 1.5) with the stepping of 0.05 or less. Furthermore, the coupled MIM waveguide structure can be integrated with other photonic devices at the chip scale. The results can provide a guide for future applications of this structure. COMSOL Multiphysics software is adopted for designing and simulating the structure. The Finite element method can also analyze the structure's spectral characteristics numerically.

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Wed/06/29

Abstract ID: 8

TBA

Kuan-I LEE, National Institute for Materials Science, Japan

TBA

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Wed/06/29

Abstract ID: 9

Investigation of laser wireless power transmission under seawater

Shunki HAYASHI, Shiro UCHIDA, Chiba Institute of Technology, Japan

With the rapid development of wireless technology in the telecommunications field, there are high expectations for wireless technology in power transmission. Optical wireless power transmission (OWPT) is attracting attention. OWPT is a technology in which light emitted from a light source is transmitted and received by a solar cell and converted into electrical energy. This technology uses laser light as the light source to achieve higher photoelectric conversion efficiency than sunlight irradiation. Furthermore, the directivity of the laser beam makes it possible to extend the transmission distance of the wireless power transmission.

Optical wireless power transmission technologies have been reported for atmospheric applications using infrared light. On the other hand, we investigated the underwater application using three visible lasers (red, green, and blue), which have relatively low attenuation in seawater. We used GaInP solar cells, having a high conversion efficiency under visible light irradiation. A laser beam was transmitted through a seawater tank and irradiated onto a solar cell in the experiment. Then, we measured the seawater's transmittance T, the solar cells' photoelectric conversion efficiency Eff, and the system conversion efficiency Esys, defined as $T \cdot Eff$.

This study demonstrated the optimum conditions and related issues for underwater wireless power transmission by changing laser wavelengths, underwater optical path lengths, and seawater sampling seasons. As a result, the highest system conversion efficiency Esys of 22.7% was obtained using winter seawater, with an underwater optical path length of 30 cm and a laser wavelength of 520 nm.

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Wed/06/29

Abstract ID: 10

Magneto-plasmonics on perpendicular magnetic nanostructures for chemical sensing applications

Haruki YAMANE, Akita Industrial Technology Center, Japan

The interaction between magneto-optical (MO) activities and surface plasmon resonances (SPRs) has been intensively investigated. The MO responses on magnetic nanostructures are significantly increased by the enhancement of the electromagnetic field associated with the excitation of propagating and localized surface plasmon polaritons. It has been reported that the large and drastic MO responses can improve the signal-to-noise ratio, sensitivity, and detection limit of chemical and biological sensors. In addition to MO properties, perpendicular magnetics are a prerequisite for many magnetic applications such as high-density magnetic and MO recording media, high-resolution MO spatial light modulators, and spin-electronic devices. In the present study, the influence of SPRs on MO polar Kerr effects was investigated for the magnetic nanostructures composed of a noble metal of Ag and perpendicular magnetic metal of CoPt. The continuous films that consist of a noble metal and magnetic transition metal layers represent a suitable system for the propagating magneto-plasmonics. The CoPt/Ag stacked films displayed an ideal square-shaped out-of-plane magnetic hysteresis loop with a large Kerr rotation angle of ±21.2°. Furthermore, the drastic MO responses with a narrow linewidth of 0.08° were useful for the chemical sensing applications. The CoPt/Ag magneto-plasmonic element with a Pd surface layer acted as a hydrogen gas detector with a highly sensitivity. Moreover, for the localized magneto-plasmonic system, the CoPt nanolayers combined with Ag fine particles produced a unique MO property, in which the Kerr rotation angle increased at a low magnetic applied field. This is due to the reversal of MO polarity associated with the excitation of localized surface plasmons on Ag particles. This magneto-plasmonic system is also a candidate for the chemical sensors because of the highly sensitive to the external environment (optical index).

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Wed/06/29

Abstract ID: 11

Dependence of bonding strength on interface edge shape

Takumi KOSHIMIZU, Masayoshi TATENO, Kogakuin University, Japan

This study provides a relationship between the interface edge shapes and the practical bonding strength of ceramics to the metal joint system.

The optimum structural design needs to make the structures possess resistance against external loads and temperature changes under the manufacturing of the ceramics to metal joint systems. However, the residual stress formed near the interface edges of the ceramics to metal joint systems weakens their strength characteristics. Reducing or disappearing the residual stresses should be required to ensure the reliability of the strength of the joint systems. This paper experimented with clarifying useful geometrical shapes of the interface edges, which can improve the bonding strength of silicon nitride and copper joint systems. The geometrical condition of the interface edge shape was characterized as the wedge angle, which was termed as a configuration angle between the plane interface and the tangential line of the edge of the interface.

Each interface edge angle of the joint system was designed by setting the location of the center and radius of the arc of the free surface at the interface edges and made using a wire-cut electric discharge machining system.

Effects of the interface edge angle on the practical bonding strength were evaluated by changing the edge angle from 40 degrees to 140 degrees on the side of the ceramic, while the interface edges were maintained sum of both edge angles as 180 degrees. A useful interface condition, which can improve the bonding strength, was considered for each bonding condition based on the experimental results.

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Wed/06/29

Abstract ID: 12

Examination of bonding method for improvement of strength of ceramics to metal joint

Masayoshi TATENO, Kogakuin University, Japan

This study provides a process to improve the bonding strength and reduce the residual stress near interface edges of ceramics to metal joints based on the dependence of bonding temperature conditions on the metal thickness effects in ceramics to metal joints. Effects of metal thickness on the bonding strength were confirmed using silicon-nitride to nickel joint made by a two-stages process. It consisted of two bonding processes: each silicon-nitride was bonded to a thin layer of the nickel at a high temperature in the first process, then a thick nickel was bonded to the thin nickel side on the joint at a lower temperature than in the first stage. The bonding strength was dominated by the residual stress near the edges of the interface between thin nickel and silicon-nitride from the observation results of the fracture pattern after the tensile test. The maximum strength was shown in the optimum nickel thickness, range between 0.2mm and 0.4mm, which depended on the first bonding temperature conditions. This result showed that the two-stages process can be used for designing high-strength joints by setting the optimum metal thickness.

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Wed/06/29

Abstract ID: 13

Microstructure and mechanical properties of a 0.1C5Mn3Al dual phase Steel

Lijuan ZHANG, Ling ZHANG, Chongqing University, China

In a previous study, laminated 0.1C5Mn3Al dual phase steels have been designed by adding Mn and Al elements to lower the density of the material, together with the aim of stabilizing austenite and ferrite phases at high temperatures and suppressing the growth of lamellae to granular shape. In the present study, the effects of different preparation processes including room temperature cold forging (CF), high temperature hot rolling (HR) or medium temperature drawing (WD) and subsequent heat treatment on the structure and properties of 0.1C5Mn3Al laminated dual phase steel were systematically investigated. The microstructural evolution during deformation and annealing were analyzed by scanning electron microscope (SEM), electron backscatter diffraction (EBSD), transmission electron microscope (TEM). The mechanical properties were obtained by tensile testing and hardness testing. The underlying deformation mechanism and the stress-strain distribution of the material during deformation were characterized and analyzed by nanoindentation, in-situ compression in SEM, in-situ tensile test in SEM with digital image correlation (DIC) and in-situ tensile test in TEM.

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Wed/06/29

Abstract ID: 14

Development of a PCL/graphene scaffold for supporting osteogenesis process

Silvia ANITASARI, Ching-Zong WU, Yung-Kang SHEN, Taipei Medical University, Taiwan

The aim of this study is to characterize the characteristics of PCL/graphene with a concentration of 0.5, 1, 5, 2, 2.5, and 3 wt% G to get high osteoconductivity, optimal bioresorbable, biodegradable, biocompatibility, and mechanical properties that support bone regeneration in bone defects. PCL/graphene scaffolds were manufactured by a solvent casting and particulate leaching technique. Water contact angle measurement revealed a transition from a hydrophobic surface (pure PCL) to a hydrophilic surface after various concentrations of graphene incorporation. The porosity of PCL or graphene did not show a significant difference between pure PCL and various concentrations of graphene; they were all around 80%. However, the pore sizes were different. It was discovered that scaffolds manufactured using 0.5 wt% G had smaller pores than scaffolds fabricated with 3 wt% G. Additionally, numerous pores were connected to one another, particularly those with bigger diameters, such as 2 and 3 wt% G. The results revealed that the proportion of water absorption varies between 50 and 350% throughout a four-month period, with the higher percentages of water-absorbing scaffold particularly on the higher concentration of graphene, such as 2, 2.5, and 3 wt%. Another physicochemical measurement is Raman spectroscopy and X-ray diffraction, which confirmed the filler presence with the ratio ID/IG increased with the addition of the graphene. Tensile testing demonstrated that the mechanical properties were improved upon graphene incorporation, with a Young modulus of 3 wt% G increasing four times more than pure PCL. Cell biocompatibility, adhesion, proliferation, and differentiation measurements using osteoblast-like cells (MG-63) revealed that PCL/graphene with a higher concentration of graphene was more biocompatible than pure PCL and a lower concentration of graphene, although all the scaffolds were biocompatible to mouse fibroblast (L929). Furthermore, the PCL/graphene scaffold induced cell adhesion, proliferation, and differentiation in osteoblast-like cells (MG-63) as well as mouse fibroblasts (L929). In conclusion, this PCL/graphene scaffold is a promising scaffold for bone injury therapy.

Keywords: PCL, Graphene, Solvent casting and particulate leaching technique, Scaffold, Biocompatible, Degradable

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Wed/06/29

Abstract ID: 15

Practical selective monohydrolysis of symmetric diesters and applications

Satomi NIWAYAMA, Muroran Institute of Technology, Japan

The advancement of environmentally benign and cost-effective organic reactions has been of central importance for the production of various important class of organic materials. Water is the least expensive and the most environmentally friendly solvents. Water-mediated organic reactions thus represent a typical “green chemistry.” Among various synthetic conversions, desymmetrization of symmetric compounds is one of the most cost-effective reactions, because the starting symmetric compounds are typically obtained easily on a large scale from inexpensive sources, or commercially available at low cost. Therefore, water-mediated desymmetrization reactions of symmetric organic compounds are of considerable value for the synthesis of organic materials.

To this end, we have been developing highly efficient and practical monohydrolysis reactions of symmetric diesters. Half-esters, which are produced by such monohydrolysis of symmetric diesters, are very versatile building blocks in organic synthesis, which are applied to synthesis of various significant compounds such as polymers and pharmaceuticals. Since the two ester groups in the starting symmetric diesters are equivalent, chemically distinguishing these ester groups has been challenging. Classical saponification usually affords slurry complex mixtures, yielding a large amount of undesirable dirty waste. Enzyme reactions provide no basis for prediction of the reactivity. Ring-opening reactions of cyclic acid anhydrides require anhydrous organic solvents. However, with our selective monohydrolysis reaction, pure half-esters are obtained in high to near-quantitative yields without producing dirty waste and without requiring hazardous organic solvents. While successful water-mediated organic reactions are still limited, this reaction takes advantage of the fact that organic compounds are not well-soluble in water and thus unique in this regard. The reactions have also been applied to the synthesis of libraries of polymers in a well-controlled manner. This reaction is anticipated to significantly contribute to green chemistry useful in both industry and academia.

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Wed/06/29

Abstract ID: 16

TBA

Liberty WU, National Institute for Materials Science, Japan

TBA

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Thur/06/30

Abstract ID: 17

Anomalous Hall effect at Pt/Cr2O3 interface

Yu SHIRATSUCHI, Kakeru UJIMOTO, Xunrui WANG, Kentaro TOYOKI, Ryoichi NAKATANI, Osaka University, Japan

Antiferromagnetic materials have been regarded as the useless materials because of no net magnetization. This prejudice is going to be overturned by recent development of spintronics which enabled us to control and detect the antiferromagnetic moment. In this talk, we demonstrate our recent results on the detection of interfacial antiferromagnetic spin in Pt/Cr2O3 system based on the anomalous Hall effect (AHE). The demonstration includes the magnetic-field reversibility of the AHE voltage, which became possible by reducing the antiferromagnetic layer thickness down below 40 nm. Based on the temperature dependence of AHE conductivity, we discuss the origin of the emerged AHE , and show the interfacial spin chirality in k-space as the possible origin.

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Thur/06/30

Abstract ID: 18

Ferrite materials for super-high-frequency band applications

Yukiko YASUKAWA, Chiba Institute of Technology, Japan

Recently, magnetic materials have been intensively studied for applications in sensing devices, spintronic torque-oscillation devices, noise suppression sheets, and radio-frequency identification (RFID) in the high-frequency range, i.e., super-high-frequency (SHF) band. Ferrites, the iron oxides, are promising materials for the use in the SHF environments because of their high resistivity values. Accurate evaluation of the permeability of ferrites in the SHF band is also indispensable for high-frequency applications.

In this study, we synthesized ferrites by a solid-state reaction method. Afterward, the ferrite grains were mixed with a polymer solution to form a sheet composed of ferrite grains and polymer matrix. The frequency dependence of complex permeability of the obtained ferrite sheets was measured in the SHF band by the short-circuited microstrip line (MSL) method. The resonant frequency of the sheet was determined by the position of the maximum permeability from the permeability-frequency profiles. The results clarified that the present sheet exhibited a resonant frequency in the GHz band. This indicates that the present ferrite sheet is applicable to frequencies in the GHz band.

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GOLDEN ACADEMY

Thur/06/30

Abstract ID: 19

GST based plasmonic biosensor for hemoglobin and urine detection

Zen SBEAH, Rammani ADHIKARI, Diksha CHAUHAN, Ram Prakash DWIVEDI, Shoolini University, India

In this paper, a simulation for a biosensor based on a Double Split Square Resonator (DSSR) has been done, and the gold resonator metamaterial structure has been used to detect the biomolecules of hemoglobin and urine using Ge-Sb-Te (GST) as a phase changing material in the infrared wavelength range from 1.9 µm to 2.4 µm. Here, the DSSR is placed on top of the GST layer. Simulation results show that the maximum detection sensitivities for hemoglobin and urine are 622 (nm/RIU) and 4043 (nm/RIU), respectively. However, sensitivity was calculated for hemoglobin and urine after optimizing the design parameters like width and height. A comparison is made based on the absorption responses with the variation of wavelengths for the two different phases of GST, which are crystalline GST and amorphous GST. In other words, the proposed DSSR gold-based metamaterial shows the potential ability to be used as a lab-on-chip biosensor.

Keywords: Phase change material, GST, absorption, sensitivity, biosensor, refractive index sensor.

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GOLDEN ACADEMY

Thur/06/30

Abstract ID: 20

TBA

Rudder WU, National Institute for Materials Science, Japan

TBA

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