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7th World Conference on

ADVANCED MATERIALS, NANOSCIENCE AND NANOTECHNOLOGY

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7th World Conference on

CHEMISTRY AND CHEMICAL ENGINEERING

NOVEMBER 21, 2024 | BANGKOK, THAILAND

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November 21, 2024 | Bangkok, Thailand

BOOK OF ABSTRACTS

Abstracts of the 7th World Conference on Advanced Materials, Nanoscience and Nanotechnology and 7th World Conference on Chemistry and Chemical Engineering

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ABOUT EURASIA CONFERENCES

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SCIENTIFIC PROGRAM

08:50-09:00 @
Introduction and Welcome Note
Conference Room:
SIAM MEETING ROOM 2

NOVEMBER 21, 2024

Keynote Session

Title: Applications of Carbon-Based Nanomaterials As Electrode Catalysts for Redox Flow Batteries (RFBs)

09:00-10:00

Dr. Barun Kumar Chakrabarti, Sabanci University Nanotechnology Research and Application Center (SUNUM), Orta Mahalle Üniversite Caddesi No:27, 34956, Tuzla – Istanbul, Turkey

Speaker Sessions

Session Chair: Dr. Barun Kumar Chakrabarti, Sabanci University Nanotechnology Research and Application Center (SUNUM), Orta Mahalle Üniversite Caddesi No:27, 34956, Tuzla – Istanbul, Turkey

Title: Materials for Integrated Quantum Technology

10:00-10:30

Dr. Rohit Ramakrishnan, Centre for High Energy Physics, Indian Institute of Science, Bangalore, Karnataka, India

Title: Synthesis of Functional Materials by In-Liquid Plasma Processing

10:30-11:00

Dr. Chiaki Terashima, Faculty of Science and Technology, Tokyo University of Science, Japan

Group Photo & Tea and Refreshments Break 11:00-11:30

Title: Synthesis of Boron-Doped Diamond Using Scale-Up Equipped Scanning In-Liquid Microwave Plasma Cvd

11:30- 12:00

Keizo Ishihara, Graduate School of Science and Technology, Tokyo University of Science, Chiba, Noda, Japan

Title: Enhancement of Photocatalytic by Metal Oxide Decorated Graphene Oxide Nanocomposites

12:00- 12:30

Dr. Sirikanjana Thongmee, Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

12:30-13:00

Title: Fabrication and Properties of Aluminum-Doped Zinc Oxide Nanorod

Laksanaphon Sridawong, Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

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14:00-14:30

Title: Green Synthesis of GQDs-Ag/Au Nanocomposites for Sensitive Electrochemical Detection of Ascorbic Acid, Dopamine and Hydrogen Peroxide

Theelada Panleam, Departments of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

14:30-15:00

Title: Synthesis WO3/rGO Nanocomposite for NH3 Gas Sensor

Warit Bunrueang, Kasetsart University, Bangkok, Thailand

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15:30-16:00

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Ganesha Honnu, Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

Poster Sessions

Poster-1

Title: Evaluation of Compressive Strength and Self-Healing Properties of No-Cement Composites Using Cementitious Material-Based Capsules

Se-Jin Choi, Professor, Department of Architectural Engineering, Wonkwang University, Republic of Korea

Poster-2

Title: Synthesis and electrical analysis of silver sulfide thin films

Jian-Xiang Lin, Department of Electronics Engineering, National Changhua University of Education, Changhua, Taiwan

Poster-3

Title: Photoelectric properties of P-CuI/N-Si heterojunction

Chi-Chao Wang and Der-Yuh Lin, Department of Electronic Engineering /National Changhua University of Education, Changhua, Taiwan

Conference Closing 16:30-17:00

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KEYNOTE PRESENTATION

https://doi.org/10.62422/978-81-981590-9-0-001

Applications of carbon-based nanomaterials as electrode catalysts for redox flow batteries (RFBs)

Barun Kumar Chakrabarti[1]
[1]Sabanci University Nanotechnology Research and Application Center (SUNUM), Orta Mahalle Üniversite Caddesi No:27, 34956, Tuzla – Istanbul, Turkey

Several positive electrodes were employed in the hydrogen/manganese hybrid redox flow battery (regenerative fuel cell). This was a follow-on work from a similar investigation on a hydrogen/vanadium RFB. Graphite felt showed a better performance and thus this was used in combination with carbon metal fabrics (prepared by means of electrospinning) to improve the performance even further. High energy efficiencies more than 84% were noted at 100 mA cm–2 along with relatively high peak power densities around 0.6 W cm–2 (for gas-liquid based hybrid RFBs only). In addition, 100 charge/discharge cycles were successfully performed at the same current density with electrolyte capacities above 20 Wh L–1. Therefore, this combination of electrodes warrants further investigations in future to optimize the H/Mn system for potential commercial exploitation. It is worth noting that biomass-derived carbon electrodes can also be prepared via electrospinning, as discussed in our current work, and could be of exceptional value for RFBs in the future.

Biography:

Barun Chakrabarti completed his MEng in Chemical Engineering at Imperial College London (ICL) and a PhD on Redox Flow Batteries (RFBs) at the University of Manchester, UK. After a year in industry, he moved to Malaysia as a Senior Lecturer. There he executed projects on applying ionic liquid electrolytes for RFBs. Then he worked at ICL, before moving to WMG and finally to SUNUM. He is experienced in electrochemical technologies for green energy applications. His current research focuses on electrophoretic deposition of nanomaterials for energy storage. He has over 60 journal publications including a couple in Wiley.

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SPEAKER PRESENTATIONS

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Materials for Integrated Quantum Technology

Dr. Rohit Ramakrishnan
Centre for High Energy Physics, Indian Institute of Science, Bangalore, Karnataka, India

This paper reviews the latest materials for integrated quantum technology, focusing on silicon-based platforms. Silicon is a valuable material for quantum tech due to its well-understood electronic properties and mature fabrication technology. It is used to fine-tune qubit operations in quantum computers, making it a key platform for quantum bits. Other materials like superconductors and topological insulators also contribute to the field. Superconductors have minimal energy loss at low temperatures, ensuring quantum coherence. Topological insulators have robust properties against environmental disturbances due to their topological surface conductivity. Integration with other leading technology silicon and photonic materials is critical for quantum communication. Material compatibility is essential for maintaining quantum state coherence. The material scalability challenge is also considered, as assessing current fabrication techniques for large-scale manufacturing is crucial. The field of integrated quantum technology is exciting, but it is essential to consider interfaces with other quantum materials to overcome current limitations and build devices that can push the boundaries of quantum technology. This discussion could catalyze the deployment of quantum technology and open a new era of practical quantum applications.

Biography:

Dr Rohit Ramakrishnan is a Postdoctoral Researcher at the Indian Institute of Science, Bangalore, specializing in Quantum Technology and artificial intelligence. He holds a PhD in Photonic Quantum Technology from the same institution, with a broad expertise that spans theory, experiment, and design. Dr Ramakrishnan previously contributed to the Quantum Satellite project at the National University of Singapore and engaged in research on Quantum Optics at the Australian Defence Force Academy. He co-authored "The Quantum Internet – The Second Quantum Revolution" and actively advances Quantum Machine Learning, combining quantum technology with interdisciplinary research to push new frontiers.

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Synthesis of Functional Materials by In-Liquid Plasma Processing

Chiaki Terashima[1,2,3]*, Hiroshi Uetsuka[2,4], Katsuya Teshima[2,3]
[1]Faculty of Science and Technology, Tokyo University of Science, 2641 Yamazaki, Noda, Chiba, 278-8510, Japan
[2]Research Center for Space System Innovation, Tokyo University of Science, 2641 Yamazaki, Noda, Chiba 278-8510, Japan
[3]Research Initiative for Supra-Materials, Shinshu University, 4-17-1 Wakasato, Nagano 380-8553, Japan
[4]Asahi Diamond Industrial Co., Ltd. 3-4-35 Kuji, Takatsu, Kawasaki, Kanagawa 213-0032, Japan

A non-equilibrium plasma, characterized by a significant disparity between electron temperature and ion temperature, offers an enticing environment for various reactions. This unique setting holds the potential to facilitate low-temperature processes in material synthesis and other applications. Particularly noteworthy is the generation of plasma in liquid, which enables reactions to occur at temperatures below the liquid's boiling point, creating a distinctive and promising reaction milieu. We set-up two different cold plasmas: one is a so-called solution plasma using a bipolar pulse power supply. The other is a liquid plasma formed in a high energy state by a microwave power supply. By controlling the power supply conditions for the generation of the in-liquid plasma, the composition of the liquid, and the gas species introduced into the reaction field, we are working to develop materials and processes, aiming to contribute to a sustainable, recycling-oriented society. In the present study, we will introduce the photocatalyst of TiO2 with oxygen-vacancy induced by solution plasma, as well as the diamond synthesis using of in-liquid microwave plasma CVD method.

Biography:

Chiaki Terashima received his Ph.D. degree (2003) in electrochemical analysis at the University of Tokyo under the supervision of Professors A. Fujishima and K. Hashimoto. His academic career started at Nagoya University as an associate professor (2010-2011) in Professor O. Takai's group, and then moved to Tokyo University of Science in 2012. He is currently a professor at Tokyo University of Science starting at 2018. His research interests are focused on photocatalysts, diamond electrochemistry, CO2 reduction, and plasma processing in liquid.

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Synthesis of Boron-Doped Diamond Using Scale-Up Equipped Scanning In-Liquid Microwave Plasma Cvd

K. Ishihara[1,2], H. Uetsuka[2,3], M. Sano[2], Yuvaraj. M. Hunge[2], *C. Terashima[1]
[1]Graduate School of Science and Technology, Tokyo University of Science, Chiba, Noda,
[2]Research Center for Space System Innovation, Tokyo University of Science, 3 Asahi Diamond Industrial Co., Ltd.,

Boron-doped diamond (BDD) has excellent electrochemical properties and can be used as an electrode for CO2 reduction, replacing precious metals such as platinum. We synthesized BDD films using in-liquid microwave plasma CVD. We enlarged the reactor from 340×220 mm3 to 590×390×250 mm3 to increase the film area. This enlargement made the synthesis challenging due to several factors, such as substrate combustion and microwave instability, which were not issues in previous reactors. In this study, we aimed to identify these factors and achieve longer deposition times. Patterning was then performed by scanning the substrate.

In the experimental setup, methanol, ethanol, tetrahydrofuran, and trimethoxyborane (B/C=1000 ppm) as a boron source were added to a reaction as liquid raw material. After reducing the pressure in the reactor to 60 kPa, microwaves were injected through a 3 mm diameter antenna to generate plasma in the bubbles formed. The substrate used was single-crystal Si, and deposition was carried out for 3 minutes.

New challenges included the burning of the substrate and microwave instability. We addressed these problems by removing bubbles remaining on the substrate and fixing the antenna. Considering the issues, we were able to confirm the formation of a BDD film on a 0.775 mm thick Si substrate after 3 minutes of synthesis. We predicted that solving these problems would enable long-duration synthesis and operation, so we performed scanning using a 2 mm thick Si substrate. As a result, we successfully obtained a film approximately 190 mm2 in size.

https://doi.org/10.62422/978-81-981590-9-0-005

Enhancement of Photocatalytic by Metal Oxide Decorated Graphene Oxide Nanocomposites

Tanawat Imboon[1], Jeerawan Khumphon[1] and Sirikanjana Thongmee[1]*
[1]Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

The hydrothermal process was used to prepare Mn3O4/x%GO nanocomposites (NC's) having different ratios of the Mn3O4 nanoparticles (NP's) on the surface of graphene oxide (GO) sheet. SEM image showed that the Mn3O4 NP's were distributed over the surface of GO sheet. HRTEM images exhibited the lattice fringe arising from the (101) plane of the Mn3O4 NP's having the interplanar d-spacing of 0.49 nm decorating on the surface of GO. The electronic absorption spectra of Mn3O4/ x%GO NC's also show broad bands from 250 to 550 nm. These bands arise from the d–d crystal field transitions of the tetrahedral Mn3+ species and indicate a distortion in the crystal structure. Photo-catalytic activity of spinel ferrite Mn3O4 NP's by themselves was low but photo-catalytic activity is enhanced when the NP's are decorating the GO sheet. Moreover, the Mn3O4/ 10%GO NC's showed the best photo-catalytic activity. This result comes from the formation of Mn–O–C bond that confirm by FT-IR. This bond would facilitate the transfer of the photoelectrons from the surfaces of the NP's to the GO sheets. PL emission which is in the violet–red luminescent region shows the creation of defects in the fabricated Mn3O4 NP's nanostructures. These defects create the defect states to which electrons in the VB can be excited to when the CB. The best degradation efficiency was achieved by the Mn3O4 NP's when they were used to decorate the GO sheets in the Mn3O4/ 10%GO NC's solution.

Biography:

Dr. Sirikanjana Thongmee now is an Assistant professor of Physics, She was in Physics Department Faculty of Science, Kasetsart University. She got her B.Sc in Physics at Prince of Songkla University, M. Sc. in Chemical Physics at Mahidol University and Ph.D. (Materials Science) at National University of Singapore. Dr. Sirikanjana Thongmee got the Thesis Presentation Award, Mahidol University, Thailand, 1999 and Outstanding Research of the Year 2nd Class Award, Office of the National Research Council of Thailand, Thailand, 2003. Currently Dr. Sirikanjana Thongmee's researches focus on the metal doped ZnO for spintronics and gas sensors applications, magnetic nanomaterials, graphene oxide for different applications and activated carbon from agricultural wasted.

https://doi.org/10.62422/978-81-981590-9-0-006

Fabrication and Properties of Aluminum-Doped Zinc Oxide Nanorod

Laksanaphon Sridawong* and Sirikanjana Thongmee
Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

This project is studed on fabrication zinc oxide nanorod and aluminum doped zinc oxide (Zn1-xAlxO) nanorods in various concentrations (1, 2, 3, 4, 5, 6 in mole percentage) by using the hydrothermal method which was done in an oven heated to180 °C with a 12 hours synthesis time. The XRD patterns showed that all of the Al- doped ZnO nanorods and all show the reflection peaks of the hexagonal wurtzite ZnO. SEM images determined that the morphologies of pure ZnO and Al doped ZnO were nanorods. They looked like hexagonal shape rods with the long axis with the c axis pointing in a variety of directions. The UV-Vis spectroscopy used to identify the formation of functional group. From UV-Vis, all samples showed an absorption in UV region of the spectra and a band edge near 400 nm. The decreasing in the energy of the band (energy) gap (3.13 to 2.6 eV) as the amount of Al was increased.

Biography:

Miss.Laksanaphon Sridawong. I am 24 years old and currently, I am a student is Master of Science in Physics Department Faculty of Science, Kasetsart University. She got her B.Sc in Physics at Kasetsart University.

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Green Synthesis of GQDs-Ag/Au Nanocomposites for Sensitive Electrochemical Detection of Ascorbic Acid, Dopamine and Hydrogen Peroxide

Theelada Panleam and Sirikanjana Thongmee*
Departments of Physics , Faculty of Science , Kasetsart University , Bangkok, Thaiiland

In the present investigation, gold (Ag-GQDs) and silver (Au-GQDs) nanocomposites were synthesized using a simple chemical process, whereas GQDs were synthesized using pyrolysis. A UV-vis spectrometer was used to investigate the optical characteristics of GQDs, Ag-GQDs, and Au-GQDs to determine the ideal concentration for the synthesis of AgNPs and AuNPs. X-ray diffraction (XRD), transmission electron microscopy (TEM), and scanning electron microscopy (SEM) were used to study the morphology, structure, and composition of the materials. Furthermore, the synthesized nanocomposites are fabricated on the glassy carbon (GC) electrodes surface by using a hexamethyl diamine (HDA) linker to examine their electrochemical characteristics. In comparison to the bare GC, GQDs modified GC (GC/GQDs), and Ag-GQDs modified GC (GC/Ag-GQDs) electrodes, the Au-GQDs modified GC electrode (GC/Au-GQDs) electrode demonstrated higher electrical conductivity and electroactive surface area. Furthermore, investigations were carried out on the electrocatalytic activity of GQDs and their nanocomposite modified electrodes towards the reduction of hydrogen peroxide (HP) and the oxidation of ascorbic acid (AA) and dopamine (DA). The GC/Au-GQDs modified electrode demonstrated greater electrocatalytic activity towards the reduction of HP and oxidation of AA and DA than GC/GQDs, GC/Ag-GQDs, and bare GC electrodes owing to its higher electroactive surface area and electrical conductivity.

Keywords graphene quantum dots, metal nanoparticles, cyclic voltammetry, impedance spectroscopy, electrochemical sensing

Biography:

Miss Theelada Panleam was born on Febuary 1, 2002 in Phetchaburi, Thailand. She received her Bachelor's Degree in Science (Physics) form Kasetsart University in 2024. After graduation, She continued with graduate studies in the Faculty of Science (Physics) , Kasetsart University. And participating research Novel electrochemical platforms for the detection of both clinical disorder biomarker and environmental pollutants using graphitic carbon nitride-conducting oligomer composites.

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Synthesis WO3/rGO Nanocomposite for NH3 Gas Sensor

Warit Bunrueang
Kasetsart University, Bangkok, Thailand

In this project, WO3/x% rGO nanocomposites (x=5%, 10%, 15%, and 20%) were synthesized using the solvothermal method. The structure of WO3/x% rGO nanocomposites was studied by X-ray diffractometer (XRD). The result showed that structure of WO3/x% rGO nanocomposites was a hexagonal. The results from Scherrer's equation determined that the crystallite sizes of all nanocomposites were similar. In addition, UV-Visible spectrometer used to study the optical property and the Energy Band Gap (Eg). The results showed that the Eg decreased with the increasing of rGO sheet. Scanning Electron Spectrometer (SEM) was used to study the surface morphology of WO3/x% rGO. The result found that Tungsten oxide (WO3) nanoparticles were distributed on the surface of rGO sheets. For NH3 sensor, the WO3/x% rGO nanocomposites can detect the NH3 gas and it is suitable for making NH3 sensor.

Biography:

My name is Warit Bunnruang. I hold a bachelor's degree in science from the Department of Physics at Kasetsart University. My passion for science and technology has driven me to explore the application of nanomaterials in gas detection, an area with significant potential and importance for future advancements, particularly in achieving precise gas detection at room temperature. After completing my undergraduate studies, I began my Master's degree, where I focused on researching and developing nanomaterials tailored for specialized gas sensors.

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Bio-Waste Carbon Material Derived From Maize Cob Doped ZnO/Co Ternary Composite Material Used for Supercapacitor Applications

Ganesha Honnu[1], Sirikanjana Thongmee[1]
[1]Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand

In recent years, biomass carbon material doped metal oxides have gained significant attention in energy storage applications due to their remarkable power density (PD) and high energy density (ED), along with superior specific capacitance (Csp), low cost, and excellent electrochemical stability. In this study, we utilized bio waste maize cob carbon material through a one-step carbonization method, and the maize cob/zinc oxide-doped cobalt oxide (MC/ZnO/Co) material was synthesized using the hydrothermal method. Additionally, various techniques are employed for the characterization of materials and structures. The FESEM analysis validates the development of a porous morphology in the MC material, whereas the MC/ZnO/Co composite material demonstrates alterations in its morphological structure. XRD, FTIR, XPS, BET, and UV-visible spectra were utilized to analyze the crystal phase, functional groups, chemical alterations, as well as optical and structural modifications in the synthesized materials. The fabricated MC/ZnO/Co composite electrode exhibits an impressive Csp of 526.3 at a current density of 2.5 A g-1, significantly surpassing the Csp values of 444 and 333.3 F g-1 for the ZnO and MC electrode materials, respectively. Furthermore, the MC/ZnO/Co composite electrode materials exhibited an elevated energy density and power density of 38.5 Whkg-1 at 1375 Wkg-1, demonstrating remarkable cyclic retention even after 5000 cycles. The findings indicate that the developed electrode material stands out as a strong contender for use in supercapacitors.

Biography:

My name is Ganesha Honnu. Currently working as a Postdoctoral fellow in the Department of Physics, Faculty of Science, Kasetsart University, Bangkok. My research area of interest, 2-D materials, Quantum dots, Metal oxides, Conducting Polymers, Photocatalyst, Supercapacitors and Electrochemical sensors applications.

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POSTER PRESENTATIONS

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Evaluation of Compressive Strength and Self-Healing Properties of No-Cement Composites Using Cementitious Material-Based Capsules

Chae-Young Kima, Joo-Ho Yoona, Gwan-Ho Kima, Jae-In Leea, Min-Jeong Kima, Se-Jin Choi b*
[a]Department of Architectural Engineering, Wonkwang University, 460 Iksan-daero, Iksan 54538, Republic of Korea
[b]Professor, Department of Architectural Engineering, Wonkwang University, 460 Iksan-daero, Iksan 54538, Republic of Korea

No-cement composites exhibit approximately 70% lower CO2 emissions than cement concrete. However, since durability can be reduced due to cracking and deterioration, research on self-healing no-cement composites is needed to prevent these problems. This study compared and analyzed the compressive strength and self-healing properties of no-cement composites containing cementitious material-based capsules. As a result of the analysis, the compressive strength at 56 days of the B-FS05 sample was the highest, and the compressive strength decreased as the capsule mixing ratio increased. In terms of compressive strength recovery rate, the B-FF05 sample showed the highest compressive strength recovery rate of approximately 114% among all samples. In addition, the sample containing 10% capsules showed a compressive strength recovery rate of approximately 110~112%, which was relatively higher than that of the Control sample (99%).

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Photoelectric properties of P-CuI/N-Si heterojunction

Chi-Chao Wang[1] and Der-Yuh Lin[2]
[1,2]Department of Electronic Engineering /National Changhua University of Education, Changhua, Taiwan

This paper uses air iodination to grow P-CuI thin film on N-type Silicon substrate. In this way, we can get a P-CuI/N-Si heterostructure diode, we will analyze its crystal structure, photoelectric and diode properties. A sunlight simulation light will be used to a source of light, when measuring I-V curve, so we can evaluate conversion efficiency and fill factor FF. Then, we use C-V to measure the junction capacitance of the heterostructure diode, and use PPC we can measure our sample's rise time and fall time in different frequence. In this paper, we can see the way we use to grow CuI is easy, and cheaper than other ways like CVD or CVT, but the quality of thin film is very well, and we also can know it has very well properties of photoelectric in different laser. We try use this sample to make a Position Sensor

Biography:

I'm Chi-Cho Wang, a graduate student at National Changhua University of Education. Our laboratory primarily measures the optoelectronic properties of semiconductors. We primarily use metals such as gold, silver, and copper as the base films and use elements like selenium, sulfur, and iodine to produce semiconductors, which we then fabricate into solar cells. Therefore, we measure the properties of many different materials. And our final goal is to make solar cell and position sensor.

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Synthesis and Electrical Analysis of Silver Sulfide Thin Films

Jian-Xiang Lin
Department of Electronics Engineering, National Changhua University of Education, Bao-Shan Changhua City, Taiwan

This experiment involves depositing a silver film on a glass substrate and transforming it into a silver sulfide film with memristor characteristics using chemical vapor deposition (CVD) techniques. We used scanning electron microscopy (SEM) and X-ray diffraction (XRD) to examine the film's surface growth quality and crystal structure. Measurements of the current-voltage (I-V) characteristics showed that Ag2S films exhibit memristive effects and can form n-Ag2S/p-silicon diodes. Ongoing photoconductivity measurements indicate that the sample demonstrates good performance under specific frequency conditions.

Biography:

I am currently pursuing a graduate degree in the Department of Electronic Engineering at National Changhua University of Education. Our lab focuses on semiconductor materials and devices, optoelectronic automatic measurement systems, solid-state optics, and the simulation of optoelectronic semiconductor device characteristics. My current research is centered on sulfides, with the goal of developing high-performance semiconductor devices through this study.

Participants Index

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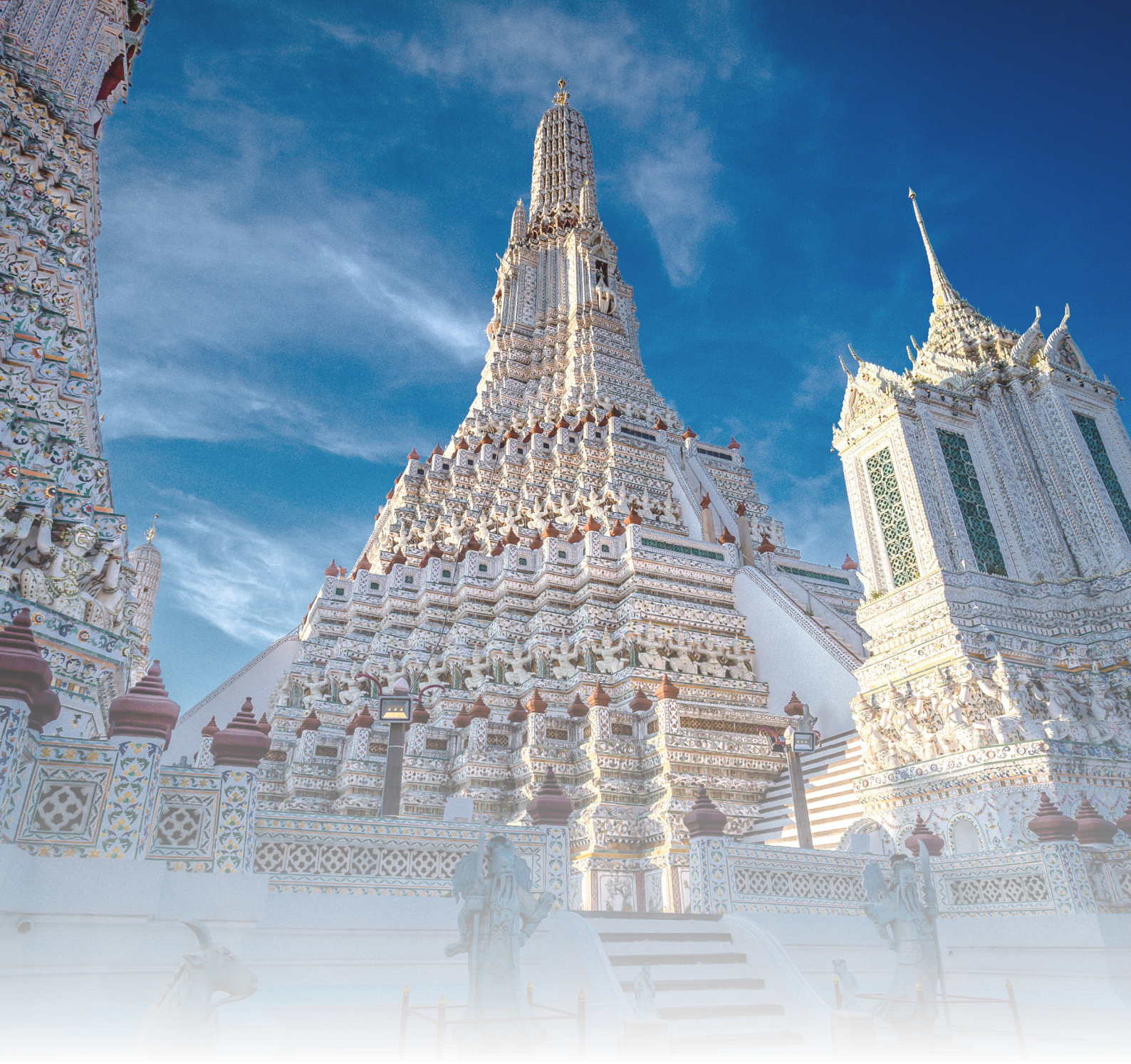

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