ABSTRACT & PROGRAM

ICEBA 2024

The 5th International Conference on Engineering, Physics, MEMS-Biosensors and Applications

Host by
VNUHCM-University of Science (Vietnam)
Tohoku University (Japan)
Mien Tay Construction University (Vietnam)

November 11&12, 2024

Organizers

Technical Supports

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VISIT OUR WEBSITE

1.The scope of the Conference

The purpose of the 5th ICEBA2024 is to link the researchers and scientists from Vietnam and countries around the world, especially Asian countries, in the fields of engineering, physics, microelectronics, semiconductors, and electronic engineering for their applications in biomedical engineering, health sciences, hi-tech agriculture, and smart cities. Besides, we also contribute to promoting international cooperation activities by joining research projects and international co-publications and proposing good solutions and applied technology for the development of the Mekong delta area.

2. The subject areas

Contributed papers must be the new research works and are solicited in the following subject areas (but not limited to):

- *Engineering, Engineering Physics and Electrical & Electronic Engineering;*
- *Medical Physics and Nuclear Engineering;*
- *MEMS (MicroElectronMechanical System), Sensors and semiconducting devices, Biomedical Engineering, Digital Microfluidics and their applications;*
- *Microelectronics, IC design, low consumption devices, Renewable Energy;*
- *Computing Science, Simulations and Modeling;*
- *Embedded systems, Internet of Things, Machine Learning, Artificial Intelligence, etc.;*
- *Civil and Geology Engineering;*
- *Constructions, Machines, and Mechanical Engineering.*

3. Time: 03 days

- Nov 10th: Registration, check-in, and welcome dinner.
- Nov 11th: Opening Ceremony & Plenary talks (at the University of Science, Ho Chi Minh City) and Transportation for Vinh Long Province (Mekong delta).
- Nov 12th: Registration, parallel sessions, poster session, meeting of 6th ICEBA2025, Closing Ceremony, and Conference Banquet (at Vinh Long province).

4. Venue:

- VNUHCM-University of Science, 227 Nguyen Van Cu Str., Dist. 5, Ho Chi Minh City, Vietnam.
- Mien Tay Construction University, 20B Pho Co Dieu Str., Ward 3, Vinh Long City, Vinh Long Province.

5. Co-organizers: University of Science (VNUHCM, Vietnam), Tohoku University (Japan), and Mien Tay Construction University (Vinh Long province).

6. Technical support: Institute Electrical Engineer of Japan (IEEJ, Japan), IEEE Vietnam Section, Institute of Korean Electrical& Electronic Engineers (IKEEE, Korea), and Ho Chi Minh Semiconducting Industrial Association (HSIA).

7. Publication:

Abstract submitted via EasyChair link: https://easychair.org/conferences/?conf=5thiceba2024

The selected papers (from 4 to 8 pages) will be reviewed or recommended for publication in one of three below Scopus/SCIE/Scimago database Journal (1,2,3) or Vietnamese Journal (4) with fee such as:

(1) The special issue of Applied Science (MDPI, Scopus, IF:5.3, Q1/Q2);

(2) IEEJ Transactions on Electrical and Electronic Engineering (Scopus, Q3);

(3) The special issue of ICEBA on IEEJ- Transactions on Sensors and Micromachines (Scopus, Q4);

(4) Journal of Construction (Ministry of Construction, Vietnam, ISSN 2734-9888);

8. Co-General Chair:

. Takahito Ono, *Tohoku University-Japan*

. Nguyen Van Hieu, *Vietnam National University Ho Chi Minh City, Vietnam*

. Huynh Van Tuan, *VNUHCM-University of Science, Vietnam*

9. Committees of 5th ICEBA2024:

*** International Scientific Committee:**

. Takahito Ono, *Tohoku University-Japan;*

. Nguyen Van Hieu, *VNUHCM-Vietnam;*

. Masaya Toda, *Tohoku University-Japan;*

. Chau Van Tao, *VNUHCM-University of Science-Vietnam;*

. Do Hong Tuan, *VNUHCM-UT & IEEE Vietnam Section;*

. Tran Tri Nang, *Minnesota University-USA;*

. Philippe Durouchux, *ESIEA, France;*

. **Jan Schulz*, Jade Univ. of Applied Sciences- Germany;***

. Dzung Dao, *Griffith University-Australia;*

. Donghan Lee, *Chungnam National University-Korea;*

. Jen-Inn Chyi, *National Central University-Taiwan (R.O.C);*

. Nguyen Van Xuan, *Mien Tay Construction University-Vietnam;*

. Le Vu Tuan Hung, *VNUHCM-University of Science-Vietnam;*

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. Truong Cong Bang, *Mien Tay Construction University-Vietnam, Co-chair;*

. Kun-Yu Lai, *National Central University-Taiwan (R.O.C);*

. Ching Tak Shing Congo, *National Chung Hsing University-Taiwan (R.O.C);*

. Tran Thien Thanh, *VNUHCM-University of Science-Vietnam;*

. Hoang Trang, *VNUHCM-University of Technology-Vietnam;*

. Huynh Chan Khon, *VNUHCM-International University-Vietnam;*

. Vu The Dang, *Osaka Metropolitan University-Japan;*

. Nguyen Chi Nhan, *VNUHCM-University of Science-Vietnam;*

. Pham Thanh Trung, *Namur University-Belgium;*

. Nguyen Hoang Nam, *VNU Ha Noi-University of Science-Vietnam;*

. Aie Boosong, *RMUTK, Bangkok, Thailand;*

. Nguyen Phuc Vinh, *Synopsyn Vietnam;*

. Nguyen Quang Khoi, *VNUHCM-University of Science-Vietnam*

. Nguyen Chi Linh, *VNUHCM-University of Science-Vietnam*

***Publication Committee:**

. Takahito Ono, *Tohoku University-Japan;*

. Nguyen Van Hieu, *Vietnam National University HCMC, Vietnam;*

. Masaya Toda, *Tohoku University-Japan;*

. Huynh Van Tuan, *VNUHCM-University of Science-Vietnam;*

. Nguyen Van Xuan, *Mien Tay Construction University-Vietnam;*

*** Local Organizing Committee:**

. Nguyen Chi Nhan, *VNUHCM-University of Science-Vietnam, Chair;*

. Vo Hong Hai, *VNUHCM-University of Science-Vietnam, Co-chair;*

. Dao Huy Hoang, *Mien Tay Construction University;*

. Ho Thanh Huy, *VNUHCM-University of Science-Vietnam;*

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. Trinh Thi Ly, *VNUHCM-University of Science-Vietnam;*

. Phan Thien Luan, *NCHU-Taiwan (R.O.C)*

…..

***Secretariats:**

. Nguyen Phuoc Hoang Khang, *VNUHCM-University of Science-Vietnam;*

. Hua Thi Hoang Yen, *VNUHCM-University of Science-Vietnam;*

. Nguyen Vuong Thuy Ngan, *VNUHCM-University of Science-Vietnam;*

. Dinh Thi Lich, *Mien Tay Construction University;*

Program

The 5th International Conference on Engineering, Physics, MEMS-Biosensors and Applications (ICEBA2024)

November 11&12, 2024;

Ho Chi Minh City and Vinh Long Province, Vietnam

*November 10th (Sunday) at HoChiMinh city

.12:00-18:00. Registration

.17:00-18:00. Meeting of Program Committee and Chair/co-chair session of ICEBA2024 at Ky Hoa Hotel (238, 3 thang 2 Street, District 10, Ho Chi Minh city);

. 18:00-20:00. ICEBA2024 welcome dinner (Plenary invited speakers, international guests, VIPs, Program Committee…) at Ky Hoa Hotel.

*November 11th (Monday) at Ho Chi Minh city and Vinh Long Province

Time	Contents/Program	Note
07:30-07:45	Registration (Check list, nameplate, Abstract & Program,…)	Lobby of conference room: No.1 Auditorium, University of Science, HCM city, Vietnam.
1.OPENING CEREMONY &PLENARY SESSION **No.1 Auditorium, 227 Nguyen Van Cu Str., District 5, HCMC**		
08:00-08:10	**1. Introduce Guests (MC)**	Introduce by MC (Dr.Ho Thanh Huy and Ms. Hua Thi Hoang Yen)
08:10-08:25	**2. Welcome speeches:** - Welcome speech from the president of VNUHCM-US*;* - Speech from Co-General Chairs of ICEBA2024; *Prof. Takahito Ono (Tohoku Univ, Japan);* - Speech from Program Chair of ICEBA2024 *Assoc. Prof. Huynh Van Tuan (Dean of FPEP, VNUHCM-US)*	
08:25-08:40	**3. Offer the gifts for invited speakers** . Plenary invited talks	MC: Prof. T.Ono, Prof. T.T. Nang, Prof. S. Jan, Prof. T.Ishida, Prof. M.Toda, Prof. C.T.S.Congo, Prof. K.S. Min, Prof. K.Y.Lai and Mr. N.P.Vinh;
	. Invited talks	MC: All invited speakers in 8 parallel sessions
08:40-08:50	**4. Offer the gifts for Technical supporters and sponsors ICEBA2024**	MC: SMATer (Taiwan), Synopsys Vietnam, ITO Vietnam, SEMI SEA, Redsun, Mantis, UDT,..
08:50-09:00	**5. The 5th Anniversary of ICEBA International Conference**	- Slide for review of ICEBA2013-2024 - Certificate of Appreciation for ICEBA2024: 11 professor/scientists/leaders and 2 units (DPEE and MTU)
09:00-09:10	**6. MoU Signing Ceremony for the 6th ICEBA2025** (Vietnam and Taiwan)	VNUHCM-US (Vietnam), ToU (Japan), NCU-DOP (Taiwan)

09:10-09:20	**Coffee break**	Lobby
	7. Plenary invited talk Session: 15 min for talk and 5 min for discussion *Chair: Prof. Masaya Toda (Tohoku University, Japan)* *Co-Chair: Assoc. Prof. Nguyen Van Hieu (VNUHCM, Japan)*	
09:20-09:40	**. Plenary #1 (code: PL.01-01): Prof. Tran Tri Nang** *University of Minnesota, USA*	Four-side buttable CMOS imaging modules for CT systems
09:40-10:00	**. Plenary #2 (code: PL.01-02): Prof. Takohito Ono** *Tohoku University, Japan*	Micro/Nanomechanical Sensors for Health and IoT
10:00-10:20	**. Plenary #3 (code: PL.01-03): Mr. Nguyen Phuc Vinh-MSc** *ARA, Synopsys, Vietnam*	Edge Artificial Intelligence (AI) Mega Trends and AI Solutions in IC Design Automation
10:20-10:40	**. Plenary #4 (code: PL.01-04): Prof. Schulz Jan** *Jade University of Applied Sciences,Wilhelmshaven, Germany*	The influence of tides on LoRa communications in self meshing sensor nodes in coastal and near shore waters
10:40-11:00	**. Plenary #5 (code: PL.01-05): Prof. Takekazu Ishida** *Osaka Metropolitan University, Japan*	High-resolution imaging using superconducting sensor under pulsed neutrons
11:00-11:10	**Summary of 5 PL talks**	Prof. Masaya Toda (Tohoku University, Japan)
11:10-11:20	**Closing the plenary session and remark the program ICEBA2024**	Assoc. Prof. N. V.Hieu, General Co-chair ICEBA
Lunch time (11:30-12:45)		

2. TRANSPORTATION FOR Vinh Long Province (MTU)

. 13:00-13:30. Pick up by Limousine bus of Conference (Bus 01, Bus02, Bus03 at main gate of University of Science);
. 13:30-15:30. Departure for Vinh Long Province (110 km);
. **15:30-16:00.** Check in hotel.
. 16:00-16:30. City tour meeting point at Kinh Thay Cai bridge (14km far from MTU), Vinh Long Province
. 16:40-18:00. Sightseeing tour in Vinh Long city.
. 18:30-21:00. Conference ‘s Welcome dinner.

*November 12nd (Tuesday) at Vinh Long Province and HoChiMinh city

1. PARALLEL SESSION: 07:30-10:15

Location: Mien Tay Construction University, Vinh Long Province
Invited talk: 15 min (12 min for talk and 3 min for discussion);
Oral presentation: 12 min (10 min for talk and 2 min for discussion).

Session 1. Engineering Physics and Electrical & Electronic Engineering

Room 101, Science Research Building - Campus B, Mien Tay Construction University

- Chair and Co-chairs:

. Assoc. Prof. Le Vu Tuan Hung (VNUHCM-University of Science, Vietnam);

. Prof. Kun Yu Lai (National Central University, Taiwan);

. Assoc. Prof. Vo Luong Hong Phuoc (VNUHCM-University of Science, Vietnam);

- Secretary: Nguyen Duy Khanh-MSc (VNUHCM-University of Science, Vietnam);

Link online: meet.google.com/ara-wbgm-dib

Schedule	*Name of invited speakers*	*Title of talks*
07:30-07:45	**Invited talk S1-01-I** Prof. Le Vu Tuan Hung *VNUHCM-US, Vietnam*	The high performance SERS substrate based on semiconductor and nano nanoparticles metal for detecting banned chemical trace in food, drug, and cosmetic.
07:45-08:00	**Invited talk S1-02-I** Prof. Chi-Hsien Huang *MCUT, Taiwan*	Biosensors fearuting an atomic layered graphene oxide/graphene composite
08:00-08:15	**Invited talk S1-03-I (online)** Assoc. Prof. Nguyen Hoang Nam *University of Science, VNU Hanoi, Vietnam*	Preparation and Biomedical application of Iron-based functional nanoparticle
Coffee break (15 mins)		
08:30-08:42	**Oral S1-01-O** Thi Kim Thao Nguyen, Van Tuan Le and Luong Hong Phuoc Vo	Application of MIKE 21/3 Coupled Model FM for selecting a suitable coastal protection scheme for Hiep Thanh commune, Tra Vinh province (Vietnam)
08:42-08:54	**Oral S1-02-O** Thanh Minh Nguyen, Chung Tran and Hong Phuoc Vo Luong	Thi Kim Thao Nguyen, Van Tuan Le and Luong Hong Phuoc Vo
08:54-09:06	**Oral S1-03-O** Duc Anh Nguyen and Hong Phuoc Vo Luong	Forecasting and assessing water demand and rice production in an giang in 2024 by using the cropwat and oryza models
09:06-09:18	**Oral S1-04-O** Duy Thanh Cu, Meng-Fu Chi and Chien-Cheng Kuo	A Novel Approach to Semiconductor Manufacturing Equipment Corrosion Protection: Fluoride Passivation of Y_2O_3 and YAG Films
09:18-09:30	**Oral S1-05-O** Duy Thanh Cu, Meng-Fu Chi and Chien-Cheng Kuo	A Novel Approach to Semiconductor Manufacturing Equipment Corrosion Protection: Fluoride Passivation of Y_2O_3 and YAG Films
09:30-09:42	**Oral S1-06-O** Huy Kim Nhat, Thuy Doan Khanh Huynh, Fan-Ching Chien and Kun-Yu Lai	DNA Test Using Nitride Surface-Enhanced Raman Spectroscopy and Machine Learning
09:42-09:54	**Oral S1-07-O** Thuy Doan Khanh Huynh, Huy Kim Nhat, Fan-Ching Chien and Kun-Yu Lai	Cancer Diagnosis with Human Blood Plasma Using Nitride Surface-Enhanced Raman Spectroscopy

Session 2. Medical Physics and Nuclear Engineering

Room 102, Science Research Building - Campus B, Mien Tay Construction University

- Chair and Co-chairs:

. Prof. T. Ishida (Osaka Metropolitan University, Japan);

. Dr. Vo Hong Hai (VNUHCM-University of Science, Vietnam)

- Secretary: Hua Thi Hoang Yen- MSc (VNUHCM-University of Science, Vietnam)

Link online: meet.google.com/ara-wbgm-dib

07:30-07:45	**Invited talk S2-01-I** Dr. MD Abdul Momin *(University of Pittsburgh, United States)*	Toward the Fabrication of Wearable Devices for Biomedical Applications: Human Activity and Cardiovascular Monitoring
07:45-08:00	**Invited talk S2-02-I (online)** Asst. Prof. Vu The Dang *(Osaka Metropolitan University, Japan)*	Transmission of Metals with Negative and Positive Scattering Length Density for Neutrons Using CB-KID Sensor
08:00-08:12	**Oral S2-02-O** Yen Thi Hoang Hua and Liet Dang Van	Denoising Techniques for Enhanced Mammogram Analysis
Coffee break (15 mins)		
08:27-08:39	**Oral S2-02-O** Thanh Nhan Huynh, Hoang Minh Le, Duy Thong Nguyen, Thien Thanh Tran and Van Tao Chau	Use Machine Learning to classify materials based on gamma scattering spectra

Session 3. Semiconductor Technologies, Materials, Devices and Related

Room 303, Science Research Building - Campus B, Mien Tay Construction University

- *Chair and Co-chair:*

. Assoc. Prof. Vu Thi Hanh Thu (VNUHCM-US, Vietnam)

. Prof. Satoru Noguchi (Osaka Metropolitan University, Japan)

- *Secretary: Tran Kim Chi-MSc (VNUHCM-University of Science, Vietnam)*

Link online: meet.google.com/ara-wbgm-dib

07:30-07:45	**Invited talk S3-01-I** Prof. Satoru Noguchi (*Osaka Metropolitan University, Japan)*	Development of Pulsed Magnetic Field Environment up to 50T below 1K
07:45-08:00	**Invited talk S3-02-I** Asst. Prof. Dr. Gaopeng Xue *(Harbin Institute of Technology, China)*	Glass-Based Micro-Hotplate with Low Power Consumption and TGV Structure
08:00-08:15	**Invited talk S3-03-I** Assoc. Prof. Dr. Le Huu Phuoc (*Ming Chi University of Technology,Taiwan*)	Recent advances in half-Heusler thermoelectrics
08:15-08:30	**Invited talk S3-04-I** Assoc. Prof. Dr. Tran Quang Trung *(VNUHCM- University of Science, Vietnam)*	Faculty of Physics and Engineering Physics – Developing the field of semiconductor technology for training and research
Coffee break (15 mins)		
08:45-08:57	**Oral S3-01-O** Nhan Nguyen Trong, Quynh Trang Ton Nu, Gia Bao Nguyen Tran and Hanh Thu Vu Thi	Fabrication and Research the AgNCs/AuNSs@PP Nanostructures for SERS Platform
08:57-09:09	**Oral S3-02-O** Nguyen Tran, Khanh Pham, Hieu Pham, Danh Nguyen, Giang Huynh, Bao Nguyen and Trung Tran	Building and programing of scara robot wafer manipulation for the sample manufacturing process using STM32 microcontrollers

09:10-09:22	**Oral S3-03-O** Anomalous Hall Effect in Co and Co (0001)/TMs interface: first-principles study	Thi Ly Trinh, Bui Trung Kien Nguyen and Duc Cuong Do
09:22-09:34	**Oral S3-04-O** Thanh Tan Cuong Mai, Thanh Huy Ho, Nguyen Toan, Chi Nhan Nguyen and Van Hieu Nguyen	The study of heat sink for the optimal power of ThermoElectric Generator (TEGs) in the Aquaponic farm

Session 4A. MEMS, Biosensors, Biomedical Engineering and Application

Room 103, Science Research Building - Campus B, Mien Tay Construction University

- Chair and Co-chair:

. Assoc. Prof. Nguyen Van Toan (Tohoku Univ, Japan)

. Prof. Congo Tak Ching (NCHU, Taiwan)

- Secretary: Nguyen Thi Tu Trinh-MSc (VNUHCM-University of Science, Vietnam)

07:30-07:45	**Invited talk S4A-01-I** Assoc. Prof. Dr. Naoki Inomata *(Tohoku University, Sendai, Japan)*	Microfabricated Thermometers: Focusing on Cellular Measurement Applications
07:45-08:00	**Invited talk S4A-02-I** Dr. BK Lok *(SEMI Southeast Asia, Singapore)*	Introduction to SEMI Technology Communtities
08:00-08:15	**Invited talk S4A-03-I** Asst. Prof. Dr. Truong Thi Kim Tuoi *(Tohoku University, Sendai, Japan)*	Advanced Cooling and Heating Systems Utilizing Nanofluids
08:15-08:30	**Invited talk S4A-04-I** Assoc. Prof. Dr. Nguyen Van Toan *(Tohoku University, Sendai, Japan)*	Nanoengineering Nanoporous Silicon Material for Thermal Energy Harvesting
Coffee break (15 mins)		
08:45-08:57	**Oral S4A-01-O** Trieu Le Ngoc, Sang Nguyen Thi Minh, Minh Truong Van, Khiem Le Hong and Son Nguyen An	Novel solution to improve the moss bag technique in environmental biological monitoring
08:57-09:09	**Oral S4A-02-O** Phuong Le Ngoc Nam, Tung Ho Quang, Linh Nguyen Khanh, Truc Do Thi Thanh, Duong Thai and Doanh Tieu Tu	Graphene nanoribbons coated on porous stainless steel as membrane for air purification and antibacterial ability with low voltage
09:10-09:22	**Oral S4A-03-O** Akane Kobayashi, Kenji Nakamura and Takahito Ono	Motor Status Measurement Using A Highly Sensitivity Magnetic Sensor
09:22-09:34	**Oral S4A-04-O** Anh Le, Danh Nguyen, Thanh Nguyen, Nguyen Tran, Giang Le and Trung Tran	Gas sensing properties of the MIL-100(Fe)/rGO composite
09:34-09:46	**Oral S4A-05-O** Thien-Luan Phan, Tun Yu Huang, Hsing-Ju Wu, Minh-Khue Ha, Ha Anh T. Nguyen, Ngoc Luan Tran, Anh-Hao Huynh-Vo, Nguyen Van Hieu and Congo Tak Shing Ching	Instant Identification of Glucose in Saliva Using Microelectrodes with Impedance Analysis

Session 4B. MEMS, Biosensors, Biomedical Engineering and Application

Room 104, Science Research Building - Campus B, Mien Tay Construction University

- Chair and Co-chair:

. Prof. Masaya Toda (Tohoku Univ, Japan)

. Assoc. Prof. Nguyen Van Hieu (IPTC-VNUHCM, Vietnam)

- Secretary: Ms. Nguyen Ngoc Thao Nhi (VNUHCM-University of Science, Vietnam)		
07:30-07:45	**Invited talk S4B-01-I** Nguyen Van Hieu *(BiSAE Lab, VNUHCM-University of Science, Vietnam)*	The DMF of Lab-On-A-Board for Biomedical Engineering studies
07:45-08:00	**Invited talk S4B-02-I** Dr. Khairul Fadzli Samat *(Fakulti Teknologi dan Kejuruteraan Industri dan Pembuatan, Universiti Teknikal Malaysia Melaka, Malaysia)*	Impact of Graphene and Nanocellulose Incorporation on Bismuth Telluride Nanocomposite Film for Micro Thermoelectric Generator
08:00-08:15	**Invited talk S4B-03-I** Dr. Sura Nguyen *(Tecnologico de Monterrey, Mexico)*	Synthesis and characterization of hierarchical suspended carbon fiber structures decorated with carbon nanotubes
08:15-08:27	**Oral S4B-01-O** Ting-Yi Shen, Ngoc-Luan Tran	The Impact of Transcutaneous Vagus Nerve Stimulation on Depression in College Students
	Coffee break (15 mins)	
08:45-08:57	**Oral S4B-02-O** Viet Huynh, Tuan Huynh	A Multi-Input Convolutional Neural Network to RecognitionTask Based on Electroencephalogram Signals
08:57-09:09	**Oral S4B-03-O** Nhi N.T. Nguyen, Ho Thanh Huy, Thien Luan Phan, Nguyen ChiNhan, Nguyen Van Hieu, Congo Tak Shing Ching	Noninvasive, Nondestructive In Ovo Chicken Egg GenderDetection Using Machine Learning Decision Tree Model
09:10-09:22	**Oral S4B-04-O** Hoa Bui	Control robot arm by EEG signal aided by artificialintelligence
09:22-09:34	**Oral S4B-05-O** Cuong Le, Tuan Huynh, Trang Doan, Thuan Nguyen	3D prior electrically resisitivity model building formagnetotelluric inversion using neural network algorithm tothe Kevitsa mineral deposit, Finland
09:34-09:46	**Oral S4B-06-O** Huy Tran Do, Viet Quoc Huynh, Tuan Van Huynh, Thinh Xuan Huynh	Application of machine learning method and artificialneural network architectures in emotion classificationusing electroencephalogram

Session 5. Microelectronics, Embedded System and AI&IoT

Room 201, Science Research Building - Campus B, Mien Tay Construction University

- Chair and Co-chair:

. Dr. Nguyen Chi Nhan (VNUHCM-US, Vietnam)

. Dr. Luong Phuoc Toan (MTU, Vietnam)

- Secretary: Vo Hoang Thuy Tien- MSc (VNUHCM-University of Science, Vietnam)

07:30-07:45	**Invited talk S5-01-I** **Ms. Tateshiro Asura** *(Ito Group, Nippon Avionic, Japan)*	Hermetic Sealing Technology for Electronic Components by Brazing Method
07:45-08:00	**Invited talk S5-02-I** Dr. Tran Thien Huan *(Saigon University, Vietnam)*	Stable Gait Optimization For Legged Robots
08:00-08:15	**Invited talk S5-03-I** **Dr. Tran Dinh Cuong**	Compensation Based on CB MRAS Technique for Induction Motor Drives

	(Ton Duc Thang University, Vietnam)	
08:15-08:30	**Invited talk S5-04-I** Dr. **Nguyen Chi Nhan** *(VNUHCM-University of Science, Vietnam)*	A slot scheduling technique application in improving battery life cycle in IoT nodes
Coffee break (15 mins)		
08:45-08:57	**Oral S5-01-O** Assoc. Prof. Dr. **Vo Ngoc Dieu** (VNUHCM-University of Technology, Vietnam)	An Improved Chaotic-Symbiotic Organisms Search Algorithm for Optimal Scheduling of Electric Vehicle Charging and Discharging in Distribution Systems with Integrated Distributed Generations
08:57-09:09	**Oral S5-02-O** Dr. **Vo Hong Hai** (VNUHCM-University of Science, Vietnam)	Development of -Based coincidence electronic using NI MyRIO Hardware for Gama-Gamma angular correlation system.
09:10-09:22	**Oral S5-03-O** **Nguyen Thi Nhu Quynh** (VNUHCM-University of Science, Vietnam)	Parkinson's Disease diagnosis by using EEG signals with IClabel and Advanced Ensemble method
09:22-09:34	**Oral S5-04-O** **Vo Hoang Thuy Tien** (VNUHCM-University of Science, Vietnam)	Recognition of basic human tastes using EEG signals
09:34-09:46	**Oral S5-05-O** **Tran Hoang Nhut** (VNUHCM-University of Science, Vietnam)	An AIoT-Based system for efficient classification
09:46-09:58	**Oral S5-06-O** **Tung Than The** (VNUHCM-University of Information Technology)	Real-time object tracking for elderly-care robot: adptive occclusion handling and model updated
10:00-10:12	**Oral S5-07-O** **Tung Than The** (VNUHCM-University of Information Technology)	Real-time object tracking for elderly-care robot: adptive occclusion handling and model updated
10:12-10:24	**Oral S5-08-O** **Duy Dieu Nguyen** (VNUHCM-University of Information Technology, Vietnam)	Recognize license plates with smart cameras using SoC technology Signal

Session 6. Computing Science, Simulation and Modeling

Room 202, Mien Tay Construction University

- Chair and Co-chair:

. Assoc. Prof. Huynh Van Tuan (VNUHCM-US)

. Dr. Nguyen Quang Khoi (VNUHCM-US))

- Secretary: Phan Nguyen Thuan-MSc (VNUHCM-University of Science, Vietnam)

07:30-07:45	**Invited talk S6-01-I** Dr. **Nguyen Quang Khoi** (VNUHCM-University of Science, Vietnam)	Development of an efficient spectrum modeling of yellow phosphor with high accuracy for white LEDs applications
07:45-08:00	**Invited talk S6-03-I** Prof. **Md. Mahabub Hossain** (*Hajee Mohammad Danesh Science & Technology University (HSTU)*)	Seamless real-time thermal imaging system with ESP8266 for wireless data transfer

08:00-08:12	**Oral S6-01-O** **Kazuyuki Hanahara** (Iwate University, Japan)	Evaluation of Disassembling Process Inference based on Positional Relations Matrix
08:12-08:24	**Oral S6-02-O** **Hien Pham Xuan** (VNUHCM-University of Science, Vietnam)	Improving the Performance of Actor-Critic PPO Model based on the Probability of Gaussian Distribution
Coffee break (15 mins)		
08:40-08:52	**Oral S6-03-O** **Anh Tran** (Ho Chi Minh City University of Technology)	Dynamic-Discrete-Set MPC for Interface Converters in Critical DC Micro-grids with Pulsed Loads
08:52-09:04	**Oral S6-04-O** **Nguyen Thi Le Thuy** (VNUHCM-University of Science, Vietnam)	Introducing a novel surface electromyography signal dataset for hand movements classification
09:04-09:16	**Oral S6-05-O** **Khanh Quoc Truong** (Ho Chi Minh City University of Technology)	Enhancing Speed Response by Implementing Improved Sliding Mode Algorithm and Fuzzy Logic Law in Controlling PMSM
09:16-09:28	**Oral S6-06-O** **C. Si Hoang** (VNUHCM-University of Science)	When will Axial Seamount be erupted? Data-Driven Approaches to Volcanology

Session 7. Architecture, Urban planning and Construction

Room 203, Mien Tay Construction University

- Chair and Co-chair:

. Dr. Wen-Yi Hung (National Central University, Taiwan)

. Co-chair: Dr. Truong Cong Bang (Mien Tay Constructions University, Vietnam)

- Secretary: Nguyen Phuoc Hoang Khang -MSc (VNUHCM-US) and Nguyen Tan Phat – MSc (MTU)

07:30-07:45	**Invited talk S7-01-I** Prof. **Wen-Yi Hung** *(National Central Univwersity, Taiwan)*	Innovative Approaches to Slope Stability Analysis Using Centrifuge Modeling.
07:45-07:57	**Invited talk S7-02-I** Assoc. Prof. Dr. **Bui Quoc Bao** *(Ton Duc Thang University, Vietnam)*	Investigation on the development of non-fired materials without cement
07:57-08:10	**Oral S7-01-O** Assoc. Prof. Dr. **Tran Tuan Minh** *(Hanoi University of Mining and Geology, Vietnam)*	The effects of joint networks on the stability of two parallel tunnels.
08:10-08:22	**Oral S7-02-O** Dr. **Lam Ngoc Qui** *(Mien Tay Construction University, Vetnam*	Evaluation of the pile group effect on the bearing capacity of precast reinforced concrete piles on soft soil.
Coffee break (15 mins)		
08:40-08:52	**Oral S7-03-O** Dr. **Trong Nhan Huynh** (Mien Tay Construction University)	Evaluating urban expansion of Mekong Delta's cities: A Case Study of Tra Vinh City.

08:52-09:04	**Oral S7-04-O** Dr. **Do Duy Thinh** (Ho Chi Minh city University of Technology and Education)	Identifying Da Lat identity using Environment-behavior studies.
09:04-09:16	**Oral S7-05-O** Dr. **Do Duy Thinh** (Ho Chi Minh city University of Technology and Education)	Identifying Da Lat identity using Environment-behavior studies.
09:16-09:28	**Oral S7-06-O** Identifying Da Lat identity using Environment-behavior studies.	Strategies to enhance capacity of a traffic intersection: case study in Nha Trang city.

2. POSTER SESSION 08:30-09:00

Lobby of Conference Hall, Mien Tay Construction University, Vinh Long Province

- *Chair:* Prof. Masaya Toda (Tohoku Univ, Japan)
- *Co-Chair: Dr. Ho Thanh Huy (VNUHCM-University of Science, Vietnam)*
- *Technical Assistant: Huynh Quoc Viet- MSc (VNUHCM-University of Science, Vietnam)*

Session 1: S1.01-P, S1.02-P, S1.03-P, S1.04-P, S1.05-P;
Session 2: S2.01-P, S2.02-P;
Session 3: S3.01-P, S3.02-P, S3.03-P, S3.04-P, S3.05-P, S3.06-P, S3.07-P;
Session 4A: S4A.01-P, S4A.02-P;
Session 4B: S4B.01-P, S4B.02-P;
Session 5: S5.01-P, S5.02-P, S5.03-P, S5.04-P, S5.04-P;
Session 6: S6.01-P, S6.02-P, S6.03-P, S6.04-P, S6.04-P, S6.05-P.
Session 7: S7.01-P, S7.02-P, S7.03-P, S7.04-P, S7.04-P, S7.05-P.

3. CLOSING CEREMONY 10:30-12:30

Location: Hall B, Mien Tay Construction University, Vinh Long Province

Time	**Contents/Program**	**Note**
10:30-10:40	**1. Introduce Guests and Remark the ICEBA2024 program**	MC (by MTU)
	2. Plenary invited talk (cont.) *Chair: Prof. Tran Tri Nang (University of Minnesota, USA)* *Co-Chair: Assoc. Prof. Nguyen Van Hieu (VNUHCM, Vietnam)*	
10:40-11:00	**. Plenary #1 (code: PL.02-01).** **Prof. Masaya Toda** (Tohoku Univ, Japan)	Atmospheric Radical Detection via Nanomechanical Magnetic Cantilever
11:00-11:20	**. Plenary #2 (code: PL.02-02)** **Prof. Kun-Yu Lai** (National Central Univ, Taiwan)	A Rapid Cancer Diagnosis by Nitride Surface-Enhanced Raman Spectroscopy
11:20-11:40	**. Plenary #3 (code: PL.02-03)** **Prof. Congo Tak Shing Ching** (National Chung Hsing Univ, Taiwan, R.O.C)	Bioimpedance sensing for detection in various fields
11:40-12:00	**. Plenary #4 (code: PL.02-04)** **Prof. Kyeong- Sik Min**	Low-power AI computing circuits with emerging memories

	(Kookmin Univ and KIEEE, Korea)	
12:00-12:05	**Summary of 4PL talks**	*Prof. Tran Tri Nang (University of Minnesota, USA)*
12:05-12:15	**3. Outstanding Oral and poster presentation**	MC
12:15-12:20	**4. Welcome for ICEBA2025 in Taiwan**	MC (by MTU) Prof. Kun-Yu Lai (DOP, NCU, Taiwan) Program co-chair of ICEBA2025
12:20-12:30	**5. Speech for closing ICEBA2024 from MTU**	Dr. Truong Cong Bang, Vice President of MTU

4. CONFERENCE GALA

* Time: 12:30-14:00
* Location: Mien Tay Construction University, Vinh Long Province

5. TRANSPORTATION FOR HOCHIMINH CITY: 14:30-16:30

PLENARY INVITED TALK SESSION 1(PL.01)

***November 11 (Monday):Conference Hall 1, VNUHCM- University of Science, Ho Chi Minh city**

Schedule	*Invited Speakers*	*Tile of talks*
09:20-09:40	**. Plenary #1 (code: PL.01-01):** **Prof. Tran Tri Nang** *University of Minnesota, USA*	Four-side buttable CMOS imaging modules for CT systems
09:40-10:00	**. Plenary #2 (code: PL.01-02):** **Prof. Takohito Ono** *Tohoku University, Japan*	Micro/Nanomechanical Sensors for Health and IoT
10:00-10:20	**. Plenary #3 (code: PL.01-03):** **Mr. Nguyen Phuc Vinh-MSc** *ARA, Synopsys, Vietnam*	Edge Artificial Intelligence (AI) Mega Trends and AI Solutions in IC Design Automation
10:20-10:40	**. Plenary #4 (code: PL.01-04):** **Prof. Schulz Jan** *Jade University of Applied Sciences,Wilhelmshaven, Germany*	The influence of tides on LoRa communications in self meshing sensor nodes in coastal and near shore waters
10:40-11:00	**. Plenary #5 (code: PL.01-05):** **Prof. Takekazu Ishida** *Osaka Metropolitan University, Japan*	High-resolution imaging using superconducting sensor under pulsed neutrons

Plenary #1 (code: PL.01-01)

Four-side buttable CMOS imaging modules for CT systems

Nang T. Tran[1,2]

[1]College of Science and Technology, University of Minnesota, 200 Union Street, Minneapolis, MN 55455, USA

[2]Ecosolar International, PO Box 28658, St Paul, MN 55128, USA

Abstract

A CMOS-based four-side buttable imaging module is proposed for the CT systems such as computed tomography, tomosynthesis and security airport inspection scheme . We call this imaging unit a "*four-side buttable CMOS module" , due to the fact that these imaging modules are abutted together to form an X-ray imager which can in turn be employed in an imaging system similar to the computed tomography or CT scan. That is, the X-ray beams are rotated around the patient; and the beams and the X-ray imagers are positioned in the opposite position in relation to the patient or the object.*

Regarding the components of the four-side buttable CMOS imaging modules , all the photodiodes, transistors and read-out electronics are made using single crystal silicon - *allowing potential high yield, thus low cost; and high electronic performance in terms of speed and noise.* The pixels and thus the modules can be operated in the low resolution mode (fluoroscopy) and high resolution mode (radiography). *In the proposed configuration, small size single crystal silicon CMOS modules are abutted together side-by-side to form a large X-ray imager. Spaces between modules are kept at less than the width of the pixels. Interconnections and the read-out schemes could be arranged at the top, the bottom or on the side walls of the modules.* Each CMOS pixel uses an N-well to P- substrate photodiode to integrate photo-generated charge and employs a thin oxide capacitor in parallel with the photodiode to increase the maximum charge handling capacity of the pixel. The signal charge is read out to a common signal line using two series connected NMOS transistors which are controlled by row and column scanning registers integrated on the imager array. Another unique feature of our circuit design is the pixel element includes at least one configurable transistor in order to implement desirable functions, for example scanning circuitry and amplification circuitry.

The configurable transistor is independent of the pair of switching transistors.All the devices and read-out electronics are made using single crystal silicon and the read-out electronics are buried underneath sensing areas.

In the proposed modules, *structured phosphors are used. Different techniques of making structured phosphors will also be discussed.*

Keywords: *four-side buttable CMOS, CT imaging systems, configurable transistor, pixelized phosphor, thallium doped cesium iodide, back side illumination,* three-dimensional image.

Short- Biography

Dr. Nang Tran received his PhD in solid state materials and device physics from Osaka Prefecture University in Japan in 1979 and did his postdoctoral research at Harvard University and the University of California, Irvine. Dr. Tran has spent 28 years in industry working on thin film solar cells, transparent conducting oxides, medical electronics, and data storage.
His main technical achievements are the co-invention of a direct x-ray digital radiography detector, a major breakthrough for digital mammography in 1990, and the co-invention of transparent conducting ZnO film doped with group III elements in 1983. At present, most of the commercial thin film photovoltaic solar modules have at least one layer of this oxide in the device configuration. During his tenure with the industry, Dr. Tran was instrumental in winning funding for several multimillion-dollar research projects and brought in multimillion-dollar licensing royalties to companies based on his inventions. He was also an invited speaker, a committee member of international conferences, and a lecturer at seminars and workshops.

Dr. Tran currently serves as an adjunct professor with the University of Minnesota, and has served as a visiting professor at universities in Vietnam and Japan. He has received more than 62 patents. Products based on his inventions have received many awards, including the prestigious Research and Development 100, Photonic Circle of Excellence. Dr. Tran was also the co-founder of Ecosolar International, a consulting company on solar energy, thin films, teleradiography, and water filtration systems. Dr. Tran is a senior life member of the IEEE, and was selected for inclusion in numerous volumes of Who's Who in America, Who's Who in Science and Engineering, Who's Who in the Midwest, Who's Who in the World, Who's Who in Finance and Industry, and Who's Who in Finance and Business.

Plenary #2 (code: PL.01-02)

Microsystems based on nanoengineering for sensing and processing

Takahito Ono

Graduate School of Engineering, Tohoku University
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Abstract

The importance of cyber-physical systems and energy-saving technologies is increasing due to the current progress of the information and communication society. We are conducting research on microsystems and their application development as fundamental technologies for these future societies on the basis of nanotechnology. A sensor system was developed to recognize complex gas systems by detecting and learning about gases response with a nanomechanical sensor array. A resistance-detected biosensor for simple health care at home was also developed. A high-sensitivity vibration-type magnetic sensor was also developed. It can monitor the state of motors in a non-contact manner. An actuator operated by spin current was also developed to realize future compact systems.

Keywords: Microsystems, Nanoengineering, Nanomechanical sensors, Magnetic sensors.

Short- Biography

Full name: Takahito Ono., Professor, Dr. Eng.
Academic position: Professor
Job's position:
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1. Research Areas*:*

- Nanoengineering and Nanotechnology
- Micro/Nanosensor
- Ultimate sensingniversity

・ Director, MicroNanomachining Research Education Center, Tohoku University

・ Executive Committee of The Electrochemical Society (ECS), USA.

・ Editorial Board, Nature Microsystems & Nanoengineering

・ Editorial board, Institute of Physics (IOP), Journal of Micromechanics and Microengineering

・ Representative Member, Japan Society of Mechanical Engineers

・ Deputy Director, IEEJ Sensors and Micromachines Division Executive Committee

・ (Invited talk) Takahito Ono, Magneto-Mechanical Micro-Nano Devices with Electrodeposited Magnetostriction Films, ECS symposium, October 8-12, 2023 – Gothenburg, Sweden. (Peer-reviewed Paper, total 310 papers)

・ (Paper) Naoki Inomata, T. Miyamoto, K. Okabe and T. Ono, Measurement of cellular thermal properties and their temperature dependence based on frequency spectra via an on-chip-integrated microthermistor, Lab on a Chip, 23 (2023) 2411-2420.

・ (Paper) H. Arisawa, H. Shim, S. Daimon, T. Kikkawa, Y. Oikawa, S. Takahashi, T. Ono, E. Saitoh, Observation of spin-current striction in a magnet, Nature Communication, 13 (2022) 2400.

4. Research Achievements and Awards:

He received Tokin Research Award from Tokin Science Foundation for the development of nanomechanical machines on 2005, also received MNC 2012 Paper Award, 15th International Microprocess and Nanotechnology Conference, IEEJ paper award 2019, Microsystem & Nanoengineering Award 2020, and IEEJ award 2022. He presented invite lectures over 60 at international conferences.

Plenary #3 (code: PL.01-03)

Edge Artificial Intelligence (AI) Mega Trends and AI Solutions in IC Design Automation

Mr. Nguyen Phuc Vinh-MSc

ARA, Synopsys, Vietnam

The rapid advancement of large language models (LLMs) such as ChatGPT, LLaMA and other lightweight LLMs, has revolutionized various fields, from natural language processing to Artificial Intelligence (AI) - driven applications. The talk will address the new era of pervasive intelligence, driven by ubiquitous AI, Silicon proliferation, and Software-defined systems. It then covers the key emerging technologies such as AI Compute, Edge-AI, AI-driven design automation, heterogeneous systems, next generation of computing architectures, etc that fuel the massive digital transformation towards the pervasive intelligence. In this keynote, we will explore the impact of Evolution of AI Compute, Edge-AI, addressing the unique challenges and opportunities they present on server based, on-device and edge-device for AI applications. The speaker will also share what we can do to stay at the forefront of these innovations.

Abstract: The rapid advancement of large language models (LLMs) such as ChatGPT, LLaMA and other lightweight LLMs, has revolutionized various fields, from natural language processing to Artificial Intelligence (AI) - driven applications. The talk will address the new era of pervasive intelligence, driven by ubiquitous AI, Silicon proliferation, and Software-defined systems. It then covers the key emerging technologies such as AI Compute, Edge-AI, AI-driven design automation, heterogeneous systems, next generation of computing architectures, etc that fuel the massive digital transformation towards the pervasive intelligence. In this keynote, we will explore the impact of Evolution of AI Compute, Edge-AI, addressing the unique challenges and opportunities they present on server based, on-device and edge-device for AI applications. The speaker will also share what we can do to stay at the forefront of these innovations.

Keywords: LLM, Edge AI, Integrated Circuit Design, AI-driven design automation.

Short- Biography

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Job's position: Senior Director of Applications Engineering, Synopsys Vietnam

1. Research Areas*:*

- *Artificial Intelligence in Electronic Design Aid*
- *Low power Design & Methodology*

2. Education:
(year, university/institute, country)
- Master: 2018, University of Science – VNU HCMC, Vietnam
- Bachelor: 2005, University of Science – VNU HCMC, Vietnam

3. Academic Activities:
Member of Faculty Council, Electronics & Communications Faculty, University of Science – VNU HCMC.

4. Research Achievements and Awards:
Research projects (Chief of Project)
-

5. Selected publications (2010-Now):
A Low-Power ASIC Implementation of Multi-Core OpenSPARC T1 Processor on 90nm CMOS Process, 2018 IEEE 12th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSoC)

Plenary #4 (code: PL.01-04)

The influence of tides on LoRa communications in self meshing sensor nodes in coastal and near shore waters

Prof. Schulz Jan

Jade University of Applied Sciences,Wilhelmshaven, Germany

** Correspoding author: jan.schulz@jade-hs.de*

Abstract.

LoRa communication is an interesting application for in-field self-meshing sensor networks. In addition to the used antenna technology a couple of environmental effects have an important impact on signal strength and transmission loss. By this, these parameters determine reliability, influence the amount of transferred data and set the framework for the overall performance.
Here we show the range impact of a diurnal tide in a wadden sea area on a LoRa communication over 12,5 km. The tidal range has a clearly verifiable influence on the Fresnel zone of the signal propagation.

Keywords: LoRa communication, transmission loss, Fresnel zone tidal impact, self-meshing sensor networks

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https://www.jade-hs.de/team/jan-schulz/

Short- Biography

Full name: Jan Schulz
Academic position: Professor
Job's position: Maritime Technology

1. Research Areas*:*
Maritime technology, Sensor networks, Marine imaging, Underwater vehicles and platforms, Data products

2. Education:
- 02/2022: Professor for Marine technology at Jade University of Applied Sciences, Wilhelmshaven, Germany
- 06/2011: Senior scientist at the University of Oldenburg, Working group 'Marine Sensor Systems', campus Wilhelmshaven, Germany
- 06/2009: Vice section head at the 'Institute of Marine Resources', Bremerhaven, Germany
- 02/2007: PhD degree in marine biology and technological development 'Spatio-temporal distribution patterns of zooplankton a methids to detect them'
-10/2002 – 06/2009: System developer and researcher at Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany
- 02/2001: Diploma in biological sciences at University of Hannover, Germany

3. Academic Activities:
Teaching in Biological oceanography, Off-shore systems, Data and Statistics, Chemistry, Marine optics, Software development for research activities

4. Research Achievements and Awards:
Various projects and actions

5. Selected publications (2010-Now):
https://www.researchgate.net/profile/Jan-Schulz-6

Plenary #5 (code: PL.01-05)

High-resolution imaging using superconducting sensor under pulsed neutrons

Takekazu Ishida[1*], The Dang Vu[1,2] Hiroaki Shishido[3], Kazuya Aizawa[2], Takayuki Oku[2], Kenichi Oikawa[2], Masahide Harada[2], Kenji M. Kojima[4,] Shigeyuki Miyajima[5], Tomio Koyama[1], Kazuhiko Soyama[2], Mutsuo Hidaka[6], Soh Y. Suzuki[7], Manobu M. Tanaka[8], Masahiko Machida[9], and Shuichi Kawamata[1]

[1]*Division of Quantum and Radiation Engineering, Osaka Metropolitan University, Sakai, Osaka 599-8570, Japan*
[2]*Materials and Life Science Division, J-PARC Center, JAEA, Tokai, Ibaraki 319-1195, Japan*
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[5]*Advanced ICT Research Institute, National Institute of Information and Communications Technology, 588-2 Iwaoka, Nishi-ku, Kobe, Hyogo 651-2492, Japan*
[6]*Advanced Industrial Science and Technology, Tsukuba, Ibaraki 305-8568, Japan*
[7]*Computing Research Center, Applied Research Laboratory, High Energy Accelerator Research Organization (KEK), Tsukuba, Ibaraki 305-0801, Japan.*
[8]*Institute of Particle and Nuclear Studies, High Energy Accelerator Research Organization (KEK), Tsukuba, Ibaraki 305-0801, Japan.*
[9]*Center for Computational Science & e-Systems, JAEA, Kashiwa, Chiba 277-0871, Japan*

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Various types of superconducting detectors have been used in the wide fields successfully because of their superior specifications such as high sensitivity, high-speed operation, high resolution, and small energy dissipation. Previously developed superconducting detectors to date include a superconducting transition edge sensor (TES) [1], a superconducting nanowire single photon detector (SNSPD) [2], and a microwave kinetic inductance detector (MKID) [3]. However, the superconducting detector has rarely been applied to detect charge-neutral neutrons. A current-biased kinetic inductance detector (CB-KID) [4] proposed by us is a kind of the superconducting detectors. It utilizes a rapid instantaneous reduction in the local Cooper pair density n_s in a tiny hot spot of the nanowire stripline in a very short length $\Delta\ell$ ($\ll$ total length ℓ). Only a tiny fractional kinetic inductance is relevant to generate a signal in CB-KID.

While it looks similar to a superconducting nanowire single-photon detector (SNSPD) in configuration, but a feeding bias current can be much smaller than the critical current of fine sensing nanowire at an arbitrarily chosen operating temperature. A pair of pulsed-voltage signals produced at the hot spot starts to propagate over a long distance more than ℓ=100 m toward two end electrodes with opposite polarities. The CB-KID can in principle detect any sort of external stimuli through local energy dissipation in the detector.

The CB-KID system for neutron applications has been developed using intense pulsed neutrons at Japan Proton Accelerator Research Complex (J-PARC). Earlier approaches focused on a CB-KID operation as the independent-pixel-based imaging with the aid of superconducting digital electronics [5], a superconducting delay-line method was instead proposed by utilizing a time-to-digital converter (Kalliope-I) as the readout circuit [6]. Two-dimensional orthogonal-meanderlines work to identify a hot-spot position (x,y) to reproduce an image using a delay time between two output-signal timestamps. A long meandered stripline in CB-KID does not owe to kinetic inductance as distinct from other kinetic inductance detectors, but works just as an impedance-matched delay-line waveguide for propagating the signals. A large number of pixels can remarkably be composed with only four-channel readouts. This is highly preferential in applying superconductive devices at a cryogenic temperature because the heat flow through leads can be suppressed remarkably. The CB-KID can be used for neutron transmission imaging with a ^{10}B conversion layer, where we used to place a test sample at the cryogenic temperature near CB-KID to avoid image blurring arising from beam divergence in our earlier studies [7,8]. We consider that a Wood's metal alloy (Bi 50wt.%, Pb 25wt.%, Sn 12.5wt.%, Cd 12.5wt.%) is a good sample to demonstrate the usefulness of the CB-KID imager. This alloy has a low melting temperature of 75.2°C. One of the four different phases of the Wood's metal is a Cd-rich needle-like precipitate (width~25 μm and length~5 mm in average) and can be a good candidate of test a neutron detector. We observed an impressive sequential change in the fine mosaic structure of Cd needles after repeated solidification of the Wood's metal from a melt.

A spatial resolution of a superconducting neutron imager has systematically been studied using a standard Gd Siemens star made of 5-μm thick Gd (Paul Scherrer Institute). It has 128 Gd spokes radially extending outward from the center. The minimum distance between two adjacent spokes is 8.6 μm at the central area. This is suitable to find a spatial resolution of CB-KID imaging. We conclude that the spatial resolution of neutron image using the Siemens star was estimated as $d=2\pi r/128 \sim 10$ μm by finding a minimum circumference radius (r), on which two adjacent Gd spokes can be resolved separately [9]. The CB-KID readout electronics has two roles (Role-I and Role-II). Role-I is 2D imaging and Role-II is time-dependent spectroscopy with the aid of time-of-flight method. High-resolution time-of-flight measurement with CB-KID under pulsed neutrons enables us to know a wavelength of a neutron precisely. This is useful to conduct a transmission spectroscopy of materials. We consider that the CB-KID method becomes worth utilizing for various purposes in various different fields.

Acknowledgements

This work is partially supported by Grant-in-Aid for Scientific Research (A) (JP16H0245, JP21H04666) and Grant-in-Aid for Early-Career Scientists (JP21K14566, JP23K13690) from JSPS. The neutron irradiation experiments at the Materials and Life Science Experimental

Facility (MLF) of the J- PARC were conducted under the support of MLF project program (No. 2021P0501).
Keywords: pulsed neutrons, transmission imaging, high-resolution, readout circuit.

References

[1] K. D. Irwin *et al*., "X-ray detection using a superconducting transition-edge sensor microcalorimeter with electrothermal feedback," Appl. Phys. Lett. 69(13), 1945-1947 (1996).
[2] J. A. Goltsman *et al.* "Picosecond superconducting single-photon optical detector," Appl. Phys. Lett. 79(6), 705-707 (2001).
[3] B. A. Mazin et al. "Multiplexable kinetic inductance detectors," AIP Conf. Proc. 605(1), 309-312 (2002).
[4] T. Ishida *et al.*, "Toward mega-pixel neutron imager using current-biased kinetic inductance detectors of Nb nanowires with ^{10}B converter", J. Low Temp. Phys. 176, 216–221 (2014).
[5] K. M. Kojima *et al.*, "New μSR spectrometer at J-PARC MUSE based on Kalliope detectors", *J Phys Conf Ser* 551, 012063 (2014).
[6] H. Shishido *et al.,* "High-speed neutron imaging using a current-biased delay-line detector of kinetic inductance", Phys. Rev. Appl. 10, 044044 (2018).
[7] T. D. Vu *et al.*, "Practical tests of neutron transmission imaging with a superconducting kinetic-inductance sensor", Nucl. Instrum. Meth. Phys. Res. A 1006, 165411 (2021).
[8] T. Ishida *et al*., "Neutron Transmission CB-KID Imager Using Samples Placed at Room Temperature", J. Low Phys. 214, 152-157 (2024).

Short- Biography

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Website: https://.....

Full name: Takekazu Ishida
Academic position: Emeritus Professor of Osaka Prefecture University
Job's position: Guest Professor of Osaka Metropolitan University

1. Research Areas*:*
Superconductivity
Vortex physics on superconductors
Application of superconductive devices

2. Education:
- Ph.D: 1982 Kyoto University
- Master: 1978 Kyoto University
- Bachelor/Engineer: 1976 Tohoku University

3. Academic Activities:

2018 – Present date Guest Professor at Division of Quantum and Radiation Engineering, Osaka Prefecture University (Osaka Metropolitan University)
2017 - 2018 Director at NanoSquare Research Institute, Osaka Prefecture University
2005 - 2018 Director at Institute for Nanofabrication Research, Osaka Prefecture University
2002 – 2018 Professor at Department of Physics and Electronics, Osaka Prefecture University
1994 – 2004 Chairman at High Tc Superconductivity Committee of JAERII (Tokai, Japan)
1993 - 2001 Associate Professor at Department of Physics and Electronics, Osaka Prefecture University
1992 Visiting Professor at National Institute for Standards and Technology (Boulder, USA)
1991 Visiting Professor at Kernforschung Zentrum Karlsruhe (Karlsruhe, Germany)
1991-1993 Associate Professor at Department of Physic, Ibaraki University
1989 Visiting Researcher at National Institute for Standards and Technology (Boulder, USA)
1983 – 1991 Assistant Professor at Department of Physics, Ibaraki University
1983 Researcher at Institute for Chemical Research, Kyoto University
1982 - 1983 JSPS Fellowship Researcher supported from JSPS

4. Research Achievements and Awards:

Research projects (Chief of Project)
2021 – 2024 Leader of KAKENHI Kiban (A) Project
2016 – 2020 Leader of KAKENHI Kiban (A) Project
2011 – 2017 Leader of KAKENHI Kiban (S) Project
2007 – 2010 Leader of KAKENHI Kiban (A) Project
2002 – 2008 Leader of CREST Research Team Project

5. Selected publications (2015-Now):

1. *T. Ishida et al., J Low Temp Phys 214, 152 (2024), "Neutron Transmission CB-KID Imager Using Samples Placed at Room Temperature".*
2. *T. D. Vu et al., J Phys Conf Ser in press (2024), "Neutron transmission imaging system with a superconducting kinetic inductance detector".*
3. *M. Hayashi et al., J Phys Conf Ser in press (2024), "Restoration of Vector Magnetization Image from Vector Scanning-SQUID Microscope Measurement".*
4. *H. Shishido et al., J Phys Conf Ser 2545, 012020 (2023), "Crystalline Orientation of CaF2 window determined by Neutron Transmission Imaging using a Delay Line Current-Biased Kinetic-Inductance Detector".*
5. *T. D. Vu et al., J Phys Conf Ser2545, 012019 (2023), "Superconducting neutron transmission imaging for investigating a sequential change in phase separations of low-melting Wood's metal"*

6. *H. Shishido et al., J. Appl. Cryst.56, 1 (2023), "Orientation mapping of YbSn3 single crystals based on Bragg-dip analysis using a delay-line superconducting sensor".*
7. *T. D. Vu et al., J Phys Conf Ser 2323, 012028 (2022), "Narrow-area Bragg-edge transmission of iron samples using superconducting neutron sensor".*
8. *H. Shishido et al., J Phys Conf Ser 2323, 12029 (2022), "Neutron Imaging toward Epithermal Regime using a Delay Line Current-Biased Kinetic-Inductance Detector".*
9. *T.D. Vu et al., Supercond. Sci. Technol., 34, 015010 (2021), "Homogeneity of neutron transmission imaging over a large sensitive area with a four-channel superconducting detector".*
10. *T.D. Vu et al., Nucl. Inst. Methods Phys. Res., A 1006, 165411 (2021), "Practical tests of neutron transmission imaging with a superconducting kinetic-inductance sensor".*
11. *H. Shishido et al., J. Phys. Conf. Ser. 1975, 012023 (2021), "Neutron Imaging for Intermetallic Alloys using a Delay Line Current-Biased Kinetic-Inductance Detector".*
12. *H. Shishido et al., IEEE Transactions on Applied Superconductivity, 31(9), 1-5 (2021), "High Spatial Resolution Neutron Transmission Imaging Using a Superconducting Two-Dimensional Detector".*
13. *T. Ishida, IEICE Tran. Electron. E103-C(5), 198 (2020), "Superconducting Neutron Detectors and Their Application to Imaging".*
14. *T. Koyama and T. Ishida, J. Phys. Conf. Ser. 1293, 012050 (2019), "Ginzburg-Landau theory for the operation principle of superconducting delay-line inductance detectors".*
15. *T.D. Vu et al., J. Phys. Conf. Ser. 1293,012051 (2019), "Temperature dependent characteristics of neutron signals from a current-biased Nb nanowire detector with 10B converter".*
16. *Y. Iizawa et al., Supercon. Sci. Tech., 32, 125009 (2019), "Energy-resolved neutron imaging with high spatial resolution using a superconducting delay-line kinetic inductance detector".*
17. *Y. Miki et al. J. Phys. Conf. Ser. 1054, 012054 (2018), "Neutron signal features of Nb-based kinetic inductance detector with 10B convertor".*
18. *T. Koyama and T. Ishida, J. Phys. Conf. Ser. 1054, 012055 (2018), "Electrodynamic theory for the operation principle of a superconducting kinetic inductance stripline detector".*
19. *Y. Iizawa et al. J. Phys. Conf. Ser. 1056, 012054 (2018), "Physical characteristics of delay-line current-biased kinetic inductance detector".*
20. *H. Shishido et al., Phys. Rev. Applied 10, 0440440-1_10 (2018), "High-Speed Neutron Imaging Using a Current-Biased Delay-Line Detector of Kinetic Inductance".*
21. *Y. Miki et al., J. Phys.: Conf. Series 1054, 012054 (2018). "Neutron signal features of Nb-based kinetic inductance detector with 10B convertor".*
22. *T. Koyama and T. Ishida, J. Phys.: Conf. Series 1054, 012055 (2018), "Electrodynamic theory for the operation principle of a superconducting kinetic inductance stripline detector".*
23. *Y. Iizawa et al., J. Phys.: Conf. Series 1056, 012054 (2018). "Physical characteristics of delay-line current-biased kinetic inductance detector".*
24. *S. Miyajima et al., Nuclear Inst. and Methods in Physics Research, A, 842, 71 (2017), "Neutron Flux Spectrum Revealed by Nb-based Current-Biased Kinetic Inductance Detector with a 10B Conversion Layer".*
25. *T. D. Vu et al., Journal of Physics Conference Series 871(1):012021 (2017) "Vector sensor for scanning SQUID microscopy".*
26. *H. Miyoshi et al., , Journal of Physics Conference Series 871(1):012021 (2017) "Simulations of vortices in a star-shaped plate with an artificial pin".*
27. *A. Ito et al., Journal of Physics Conference Series 871(1):012021 (2017) "Numerical restoration of surface vortices in Nb films measured by a scanning SQUID microscope".*
28. *N. Fujita et al., Journal of Physics: Conf. Series 807, 052014 (2017), "Fractional vortices in a nano-scaled superconducting composite structure (d-dot) with a twin boundary".*
29. *T. D. Vu et al., Physica C, 533, pp. 44-48 (2017) "Vortex distribution in small star-shaped Mo80Ge20 plate".*
30. *H. Matsumoto et al., Physica C, 530, pp. 46-50 (2016) "Vortex distribution in amorphous Mo80Ge20 plates with artificial pinning center".*
31. *H. Miyoshi et al., Physics Procedia 81, 89 – 92 (2016) "Ginzburg-Landau calculations of star-shaped Mo80Ge20 superconducting small plates".*
32. *H. Matsumoto et al., Physics Procedia 81 (2016) 93 – 96, "Ginzburg-Landau calculations of circular Mo80Ge20 plates with sector defect".*
33. *A. Bozbey et al., IEICE Transactions on Electronics, E99C, 676-682 (2016) "Development of a neutron imager based on superconducting detectors".*
34. *H. Shishido et al., IEEE Xplore Superconductive Electronics Conference (ISEC), 2015, DR-O17 1-3 (2015), "Current-biased kinetic inductance detector for neutrons".*

35. *S. Miyajima et al., IEEE Xplore Superconductive Electronics Conference (ISEC), 2015, DR-P21 pp.1-3 (2015), "Coincidence detection of double-layered current-biased kinetic inductance detectors using a 20 ps pulsed laser".*
36. *H. Shishido et al., Applied Physics Letters, 107,.232601_1-4 (2015), "Neutron detection using a current biased kinetic inductance detector".*
37. *N. Fujita et al., Physica C: Superconductivity and its Applications, 518, art. no. 1252851, pp. 44-46 (2015) "Twin boundary effects on spontaneous half-quantized vortices in superconducting composite structures (d-dot's)".*
38. *H. Shishido et al., Applied Physics Express, 8 (11), art. no. 113101 (2017) "Ambient temperature epitaxial growth of MgB2 thin films with a Mg buffer layer".*
39. *H. Shishido et al. Physics Procedia, 75, pp. 405-412 (2017), "Semi-Epitaxial SmB6 Thin Films Prepared by the Molecular Beam Epitaxy".*
40. *Y. Narukami et al., , IEEE Transactions on Applied Superconductivity, 25, 6995946 (2015), "20 ps pulsed laser irradiation to current-biased kinetic inductance detector made of Nb nanowires".*
41. *N. Yoshioka et al., Journal of Low Temperature Physics, 176 (3-4), pp. 273-278 (2014) , "Four-channel current-biased kinetic inductance detectors using MgB2 nanowires for sensing pulsed laser irradiation".*
42. *T. Ishida et al., IEEE Transactions on Applied Superconductivity, 25, 7051246 (2015), "Toward neutron radiography using two arrays of Nb-based current-biased kinetic inductance detectors with 10B converter sandwiched in-between".*

PLENARY INVITED TALK SESSION 2 (PL.02)

***November 12 (Tuesdaay): Conference Hall B, Mien Tay Construction University, Vinh Long**

Schedule	*Invited Speakers*	*Tile of talks*
10:40-11:00	**. Plenary #1 (code: PL.02-01).** **Prof. Masaya Toda** (Tohoku Univ, Japan)	Atmospheric Radical Detection via Nanomechanical Magnetic Cantilever
11:00-11:20	**. Plenary #2 (code: PL.02-02)** **Prof. Kun-Yu Lai** (National Central Univ, Taiwan)	A Rapid Cancer Diagnosis by Nitride Surface-Enhanced Raman Spectroscopy
11:20-11:40	**. Plenary #3 (code: PL.02-03)** **Prof. Congo Tak Shing Ching** (National Chung Hsing Univ, Taiwan, R.O.C)	Bioimpedance sensing for detection in various fields
11:40-12:00	**. Plenary #4 (code: PL.02-04)** **Prof. Kyeong- Sik Min** (Kookmin Univ and KIEEE, Korea)	Low-power AI computing circuits with emerging memories

Plenary #1 (code: PL.02-01)

Stress sensing using nitrogen vacancy color center in a nano-diamond fixed on a Si cantilever

Masaya Toda1*[0000-0003-3849-6948]

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Abstract. One of the most interesting properties of nano-diamonds is the photoluminescence from crystal defects called nitrogen vacancy centers (NVC), and the optically detected magnetic resonance (ODMR) spectrum emitted from NVC in nano-diamond is highly sensitive to external magnetic fields and stress changes. In our research, we introduce a novel cantilever-type force probe enhanced with a nano-diamond nitrogen vacancy color centers (NVCs). Nano-diamonds are embedded in the SiO_2 layer on the Si cantilever surface. When the cantilever vibrates upward and downward, compressive and tensile stresses are alternately applied to the surface nano-diamond. The ODMR spectrum of NVC was measured with confocal microscope. In this experiment, the peaks were split into four (2 by 2) by adjusting one of four crystal axis of the ensemble NVC and the static magnetic field axis. The peak shift was measured by comparing fluorescence spectra with and without stress. As a result, the peak shift was observed due to the stress generated by the vibration of the cantilever. In addition, the peak shifts depend on the stress applied to the diamond by changing the vibration amplitude of the cantilever.

Keywords: nano-diamond, nitrogen vacancy, magnetic resonance, NVC, Si cantilever.

Short- Biography

Plenary #2 (code: PL.02-02)

A Rapid Cancer Diagnosis by Nitride Surface-Enhanced Raman Spectroscopy

Kun-Yu Lai*, Nguyen Thi-Anh Nguyet, Thuy Doan Khanh Huynh, Huy Kim Nhat and Fan-Ching Chien

Department of Optics and Photonics, National Central University, Chung-Li, Taoyuan 32001, Taiwan

**Correspoding author: kylai@ncu.edu.tw*

Abstract.

Cancer is fatal, but can be cured if detected early. Tracking circulating tumor DNA (ctDNA), released from abnormal cells into the blood, is a promising tactic for cancer diagnosis. Although technically feasible, unambiguously identifying ctDNA is a challenging and demanding task. This is because the task often entails four complicated steps, i.e., surface functionalization, probe immobilization, fluorescent labeling and probe-target hybridization. Each step requires multiple hours to complete the binding between functional molecules. To capture the target quickly, we present a linker-free, label-free, hybrid-free DNA detection by surface-enhanced Raman spectroscopy (SERS), using InGaN quantum wells (QWs) as a performance booster. This is realized by tuning the band gaps of QWs, within which the confined electrons resonate with those vibrating on the roughened Al surface and the oligonucleotide. The QW-Al-DNA resonance results in a selective amplification of specific SERS signals, allowing us to identify four distinct ctDNAs responsible for pancreatic, thyroid, lung, and breast cancers.

Keywords: cancer, DNA, SERS, biosensor, InGaN.

References (max: 10):

[1] Fang Yin Zhao, Nguyen Thi Anh Nguyet, Chia-Wei Tsai, Che-Men Chu, Wei-Yen Woon, Chien-Ting Wu, Kun-Lin Lin, Yo-Song Huang, Chih-Ming Wang, Fan-Ching Chien, and Kun-Yu Lai, Catching single molecules with plasmonic InGaN quantum dots, *Adv. Opt. Mater.* **11**, 2300431 (2023).
[2] Thi Anh Nguyet Nguyen, Ying-Lung Yu, Ya Chien Chang, Yu-Han Wang, Wei-Yen Woon, Chien-Ting Wu, Kun-Lin Lin, Cheng-Yi Liu, Fan-Ching Chien, and Kun-Yu Lai, Controlling the electron concentration for surface-enhanced Raman spectroscopy, *ACS Photonics* **8**, 2410 (2021).
[3] Fan-Ching Chien, Ting Fu Zhang, Chi Chen, Thi Anh Nguyet Nguyen, Song-Yu Wang, Syuan Miao Lai, Chia-Hua Lin, Chun-Kai Huang, Cheng-Yi Liu, and Kun-Yu Lai, Nanostructured InGaN quantum wells as a surface-enhanced Raman scattering substrate with expanded hot spots, *ACS Appl. Nano Mater.* **4**, 2614 (2021).

[4] J. S. Shin and S. Li, DNA-immobilized Fluorescent Polystyrene Nanoparticles as Probes with Tunable Detection Limits. *ACS Omega* **7**, 48310 (2022).

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Website of personal/ lab/dept: https://kylai.cloudweb.com.tw/

Short- Biography

Full name: Kun-Yu Lai, Professor, Ph.D.
Academic position: Professor
Job's position:
Optoelectronic Material and Device Lab, Department of Optics & Photonics, College of Science, National Central University, Taoyuan, Taiwan

1. Research Areas*: Design, growth and fabrication of novel III-Nitride optoelectronic devices.*

2. Education:
- Post doc: 8/2009 ~ 6/2011, Inst. of Photon. & Optoelect., National Taiwan University, Taiwan
- Ph.D.: 8/2005 ~ 6/2009, North Carolina State University, USA
- Master: 9/1999 ~ 12/2002, University of California, Santa Barbara, USA
- Bachelor: 9/1995 ~ 6/1999, National Chiao Tung University, Taiwan

3. Academic Activities:
Members of academic society:
- *Materials Research Society, USA, 2024*
Invited Talk:
"Label-Free Biosensors Built with Nitride-based Surface Plasmon Resonance", *Materials Science-2016, Dubai, UAE, 2016. (invited talk)*
Visiting researcher/professor (university/institute, where, when)
- Visiting Scholar, Dept. NanoEngineering, University of California, San Diego, USA, 8/2017 ~ 7/2018.
Supervisor for Ph.D. thesis:
- Building surface-enhanced Raman spectroscopy with InGaN quantum wells, National Central University, Taiwan, 2020
- High quality AlN and BN grown by MOCVD for deep UV LEDs, National Central University, Taiwan, 2020
- Design, fabrication and analysis of high-voltage thin-film GaN LEDs on ceramic substrates, National Central University, Taiwan, 2014

4. Research Achievements and Awards:

Research projects (2010-now): Chief of Project

[1]. "A label-free linker-free detection of circulating tumor DNA by Al-decorated nanostructured InGaN quantum wells" (8/2022 ~ 7/2024)

[2]. "Nitride Surface Enhanced Raman Scattering: A New Microarray
Biochip for Nucleic-acid Detection and Biological Manufacturing" (8/2020 ~ 7/2021)

[3]. "The DNA microarray biochips by nitride-based active surface plasmon resonance imaging" (8/2019 ~ 7/2020)

Intellectual Property

[1]. United States Patent 10976577, "Sensing Substrate, Manufacturing Method thereof, and Sensor", April 13, 2021

Books

[1]. J.R.D. Retamal, C.Y. Chen, **K.Y. Lai** and J.H. He, "ZnO-based nanostructures," Chapter 4 in Handbook of Zinc Oxide and Related Materials: Volume Two, Devices and Nano-Engineering, Taylor & Francis Group (2012) ISBN: 978-143-985-574-4.

….

Research Awards

[1]. Outstanding Research Awards, Dept. Optics & Photonics, National Central University (2015 ~ 2020).

5. Selected publications (2010-Now):

[5] Le Yen Nhi Phan, Thi Anh Nguyet Nguyen, Hong Long Chen, Wen-Yih Chen, Ching-Jen Yang, Fan-Ching Chien, Cheng-Yi Liu, and **Kun-Yu Lai***, "Detecting glucose in cell culture medium by the surface-enhanced Raman scattering on InGaN quantum wells", *Opt. Contin.* **2**, 2509 (2023). (SCI 2023 IF: 1.1, 93/119 (Q4) in OPTICS)

[6] Muzafar Ahmad Rather, Loganathan Ravi, Tung-Yuan Yu, Chien-Ting Wu, Kun-Lin Lin, **Kun-Yu Lai**, Jen-Inn Chyi*, "An experimental study of the energy band alignments of B(Al, Ga)N heterojunctions", *Appl. Phys. Lett.* **123**, 012101 (2023). (SCI 2023 IF: 3.5, 59/179 (Q2) in PHYSICS, APPLIED)

[7] Fang Yin Zhao, Nguyen Thi Anh Nguyet, Chia-Wei Tsai, Che-Men Chu, Wei-Yen Woon, Chien-Ting Wu, Kun-Lin Lin, Yo-Song Huang, Chih-Ming Wang, Fan-Ching Chien*, and **Kun-Yu Lai***, "Catching single molecules with plasmonic InGaN quantum dots", *Adv. Opt. Mater.* **11**, 2300431 (2023). (SCI 2023 IF: 8.0, 10/119 (Q1) in OPTICS) (Citation: 2)

[8] Loganathan Ravi, Muzafar Ahmad Rather, Kun-Lin Lin, Chien-Ting Wu, Tung-Yuan Yu, **Kun-Yu Lai**, and Jen-Inn Chyi*, "Epitaxial growth of GaN/AlN on h-BN/Si(111) by metal–organic chemical vapor deposition: An interface analysis", *ACS Appl. Electron. Mater.* **5**, 146 (2023). (SCI 2023 IF: 4.3, 83/352 (Q1) in ENGINEERING, ELECTRICAL & ELECTRONIC) (Citation: 5)

[9] Thi Anh Nguyet Nguyen, Ying-Lung Yu, Ya Chien Chang, Yu-Han Wang, Wei-Yen Woon, Chien-Ting Wu, Kun-Lin Lin, Cheng-Yi Liu, Fan-Ching Chien*, and **Kun-Yu Lai***, "Controlling the electron concentration for surface-enhanced Raman spectroscopy", *ACS Photonics* **8**, 2410 (2021). (SCI 2023 IF: 6.5, 14/119 (Q1) in OPTICS) (Citation: 6)

[10] Fan-Ching Chien, Ting Fu Zhang, Chi Chen, Thi Anh Nguyet Nguyen, Song-Yu Wang, Syuan Miao Lai, Chia-Hua Lin, Chun-Kai Huang, Cheng-Yi Liu, and **Kun-Yu Lai***, "Nanostructured InGaN quantum wells as a surface-enhanced Raman scattering substrate with expanded hot spots", *ACS Appl. Nano Mater.* **4**, 2614 (2021). (SCI 2023 IF: 5.3, 122/438 (Q2) in MATERIALS SCIENCE, MULTIDISCIPLINARY) (Citation: 8)

[11] Chun-Pin Huang, Muzafar Ahmad Rather, Chien-Ting Wu, Ravi Loganathan, Ying-Hao Ju, Kun-Lin Lin, Jen-Inn Chyi, and **Kun-Yu Lai***, "Crystal transformation of cubic BN nanoislands to rhombohedral BN sheets on AlN for deep-UV light-emitting diodes", *ACS Appl. Nano Mater.* **3**, 5285 (2020). (SCI 2023 IF: 5.3, 122/438 (Q2) in MATERIALS SCIENCE, MULTIDISCIPLINARY) (Citation: 3)

[12] Chun-Pin Huang, Kapil Gupta, Chuan-Pu Liu, and **Kun-Yu Lai***, "Ultra-flat AlN grown with a pulsed H_2 etching condition", *Appl. Phys. Express* **12**, 015509 (2019). (SCI 2023 IF: 2.3, 100/179 (Q3) in PHYSICS, APPLIED) (Citation: 7)

[13] Fan-Ching Chien, Jen-Long Lo, Xingwang Zhang, Ertugrul Cubukcu, Yu-Tang Luo, Kai-Lin Huang, Xiaofang Tang|, Chien-Sheng Chen, Chii-Chang Chen, and **Kun-Yu Lai***, "Nitride-based microarray biochips: A new route of plasmonic imaging", *ACS Appl. Mater. Interfaces* **10**, 39898 (2018). (SCI 2023 IF: 8.3, 69/438 (Q1) in MATERIALS SCIENCE, MULTIDISCIPLINARY) (Citation: 11)

[14] Meng-Cheng Chou, Chia-Yi Lin, Bo-Lin Lin, Chang-Han Wang, Shih-Hui Chang, Wei-Chih Lai, **Kun-Yu Lai**, and Yun-Chorng Chang*, "Polarization-selecting III-nitride elliptical nanorod light-emitting diodes fabricated with nanospherical-lens lithography", *ACS Nano* **12**, 8748 (2018) (SCI 2023 IF: 15.8, 27/438 (Q1) in MATERIALS SCIENCE, MULTIDISCIPLINARY) (Citation: 13)

Plenary #3 (code: PL.02-03)

Bioimpedance sensing for detection in various fields

Congo Tak Shing Ching

Graduate Institute of Biomedical Engineering, National Chung Hsing University,Taiwan

Abstract

The development of impedance sensing technology has brought revolutionary changes in many fields and solved many problems. Impedance sensing technology typically uses the relationship between current and voltage to measure specific properties of a material or system. This technology has wide applications in medical, environmental monitoring, food safety testing and other fields.

In the medical field, impedance sensing technology is used for physiological monitoring, such as body composition analysis of fat and muscle tissue. Impedance sensors can also be used to monitor breathing and movement of body parts, helping diagnosis and treatment.

In terms of environmental monitoring, impedance sensing technology can be used to monitor moisture content in soil, concentration of pollutants, and fluid flow in pipelines. This helps improve agricultural production efficiency and ensures efficient use of water resources and environmental protection.

In terms of food safety testing, impedance sensing technology can be used to detect harmful substances in food, such as heavy metals, pesticide residues and additives, to ensure that food meets safety standards.

In this talk, the speaker cites his own research experience applying impedance in many different fields.

Keywords: *Bioimpedance, sensing, detection, medical, environmental, food science.*

Short- Biography

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Academic position: Professor
Job's position: Professor, Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung, Taiwan

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1. Research Areas*:*
Biomedical instrumentation design, biosensors, tissue bioimpedance, biomedical electronics, biomedical optoelectronic, AIoT healthcare, assistive healthcare technologies

2. Education:
(month/year to month/year, university/institute, country)
PhD in Bioengineering, University of Strathclyde, Glasgow, UK, 2005
MPhil in Biomedical Engineering, The Hong Kong Polytechnic University, HK, 2002
BSc in Prosthetics and Orthotics (First Class Honours), The Hong Kong Polytechnic University, HK, 1999

3. Academic Activities:
Members of academic society (name of society, position, where, when)
Member, Prosthetics and Orthotics Society of Taiwan, since 2016
Life Member, Taiwan Engineering Medicine Biology Association, since 2023
Life Member, Association of Chemical Sensors in Taiwan, since 2015
Life Member, Taiwan Rehabilitation Engineering and Assistive Technology Society, 2013
Life Member, The Chinese Institute of Engineers, Since 2013
Member, IEEE, since 2010
Member, IEEE Engineering in Medicine and Biology Society, since 2010
Life Member, World Association for Chinese Biomedical Engineers, since 2009
Member, International Association of Engineers (IAENG), since 2009
Life Member, Biomedical Engineering Society of the R.O.C., since 2008
Member, The Royal Society of Edinburgh Entrepreneurs' Club, since 2005
Invited talks for International conference/workshop (name of talk, name of conference/workshop, where, when)
Keynote speaker of The International Symposium on Applied Science (ISAS 2023), 13-15 Oct 2023, Ho Chi Minh City, Vietnam

	Keynote speaker of Rencontres du Vietnam: The first International Symposium of Nano Life Science: Nano Biotechnology, Biosensor, Computation (NanoBioCoM2023), 17-19 Sep 2023, ICISE, Quy Nhon, Vietnam Keynote speaker of International Symposium on Medical Devices and Technology 2023, 27-28 Aug 2023, Johor, Malaysia Plenary speaker of The 3rd International Workshop on Engineering Physics, IC-MEMS-Sensors and Their Applications (3rdIWEMA2022), 25-26 Nov 2022, Ho Chi Minh City, Vietnam Keynote speaker of IEEE The 2nd International Conference on Intelligent Cybernetics Technology & Applications 2022 (IEEE ICICyTA 2022), 15-16 Dec 2022, Bandung, Indonesia Invited speaker of International Joint Symposium on Applied Mathematics, Science and Technology, 01 Dec 2022, Taichung, Taiwan Invited speaker of The 38th SENSOR SYMPOSIUM, 9-11 Nov 2021, Japan Keynote speaker of The International Symposium on Applied Science 2021, 15-17 Oct 2021, Ho Chi Minh City, Vietnam Keynote speaker of The Fifth International Conference on Biological Information and Biomedical Engineering (BIBE2021), 20-22 Jul 2021, Hangzhou, China Keynote speaker of the 3rd International Conference on Bioscience and Medical Engineering (ICBME2021), 29-30 Jun 2021, Johor Bahru, Malaysia Invited speaker of Distinguished Lecture Series, Universiti Teknologi Malaysia, 12 Nov 2020, Malaysia Plenary speaker of International Convention on Rehabilitation Engineering and Technology (i-CREATe 2020), 5-7 Nov 2020, Taipei, Taiwan Keynote speaker of International Conference on Biological Information and Biomedical Engineering (BIBE 2018), 6-8 Jul 2018, Shanghai, China Keynote speaker of The 2nd International Conference on Biomedical and Biological Engineering (BBE2017), 26-28 May 2017, Guilin, China Keynote speaker of The International Conference on Biological Engineering and Pharmacy (BEP2016), 9-11 Dec 2016, Shanghai, China Keynote speaker of The International Conference on Biomedical and Biological Engineering (BBE2016), 15-17 Jul 2016, Shanghai, China Invited speaker of The 11th Annual IEEE International Conference on Nano/Micro Engineered and Molecular Systems, 17-20 April 2016, Matsushima Bay and Sendai MEMS City, Japan *Visiting researcher/professor (university/institute, where, when)* Visiting Professor, Department of Physics and Electronic Engineering University of Science (Vietnam National University of Hochiminh City), Vietnam, 06/2019 – 07/2019 Honorary Professor, Department of Health and Physical Education The Education University of Hong Kong, Hong Kong, 11/2016 – 10/2019 *Academic suppervisor for master/Ph.D thesis (name of title thesis, university/institute, where, when)*

	4. Research Achievements and Awards: *Research projects (2010-now): Chief of Project* https://www.bme.nchu.edu.tw/members/tsching/index.htm *Intellectual Property* https://www.bme.nchu.edu.tw/members/tsching/index.htm *Research Awards* https://www.bme.nchu.edu.tw/members/tsching/index.htm **5. ISI/Scopus/SCIE Selected Publications (2010-Now):** https://www.bme.nchu.edu.tw/members/tsching/index.htm

Plenary #4 (code: PL.02-04)

Low-power AI computing circuits with emerging memories

Kyeong-Sik Min
School of Electical Engineering, Kookmin University, Seoul, Korea
Correspoding author: mks@kookmin.ac.kr

Abstract.
The imminent Internet-of-Things (IoT) era demands a vast network of sensors and edge devices to enhance human life, generating unprecedented volumes of unstructured data. Conventional cloud-based processing of this data poses significant energy challenges, potentially leading to unsustainable levels of power consumption in data centers and communication networks. This paper explores low-power AI computing circuits utilizing emerging memories as a solution to this impending energy crisis. We focus on processing-in-memory techniques for edge computing and IoT sensors, which can dramatically reduce data transmission to centralized servers. By departing from the energy-inefficient Von Neumann architecture, these approaches offer substantial improvements in computing energy efficiency. Our research investigates various emerging memory technologies and their crossbar arrays, with a particular emphasis on memristor crossbars, as promising candidates for realizing energy-efficient edge intelligence. We present novel circuit designs that leverage these technologies to enable in-memory computing, significantly reducing power consumption while maintaining computational performance. This work addresses the challenges and opportunities in integrating emerging memories into AI circuits, paving the way for ultra-low-power AI systems that can support the expanding IoT ecosystem without compromising on performance or functionality.

Keywords: low-power AI computing, emerging memories, memristor crossbars, internet of things, edge computing.
Acknowledgements: The work was financially supported by RS-2024-00401234, RS-2024-00406006, and RS-2024-00441473. The CAD tools were supported by IC Design Education Center (IDEC), Daejeon, Korea.

Short- Biography

Full name: Kyeong-Sik Min, Professor, Ph.D.
Academic position: Professor
Job's position: School of Electrical Engineering, Kookmin University, Seoul, Korea

Contacts:
Email address:
mks@kookmin.ac.kr

1. Research Areas*:*
- Processing in memory
- Neuromorphic circuits and systems
- Memory circuits and systems

2. Education:
(month/year to month/year, university/institute, country)
- Post doc: 12/2001-08/2002, University of Tokyo, Japan
- Ph.D: 03/1993-08/1997, KAIST, Korea
- Master: 03/1991-02/1993, KAIST, Korea……
- Bachelor/Engineer: 03/1987-02/1991, Korea Univ., Korea

3. Academic Activities:
Members of academic society (name of society, position, where, when)
1.Distinguished Service Award from Korea Semiconductor Industry Association (KSIA), Oct. 2023
2.President of Institute of Korean Electrical and Electronics Engineers (IKEEE), 2022
3.Chairperson of SoC Research Group in Institute of Electronics and Information Engineers (IEIE), 2021
4.Award of Excellence in Academy-Industry R&D Cooperation from Mayor of Seoul City, 2021
5.Grand Prize in Haedong Best Paper Award, IEIE, Journal of Semiconductor Technology and Science (JSTS), 2020
6.Distinguished Service Award from Ministry of Science and ICT of Korean Government, 2020
7.Academic Achievement Award, Institute of Korean Electrical and Electronics Engineers, Korea, 2015
8.Distinguished Service Award, Institute of Korean Electrical and Electronics Engineers, Korea, 2014
9.Chip Design Contest Award at Korean Conference on Semiconductors, 2012
10.CAD & Design Methodology Award at Korean Conference on Semiconductors, 2011
11.Chip Design Contest Award at Korean Conference on Semiconductors, 2011
12.Distinguished Service Award, Institute of Electronics and Information Engineers, Korea, 2011-…

PARALLEL SESSION

Session 1. Engineering Physics, Applied Physics and Electronic Engineering

- - Chair and Co-chairs:
  - . **Assoc. Prof. Le Vu Tuan Hung** (VNUHCM-Univ. of Science)
  - **. Prof. Kun Yu Lai** (National Central Univ, Taiwan)
  - . **Assoc. Prof. Vo Luong Hong Phuoc** (VNUHCM-Univ. of Science);
- - Secretary: **MSc. Nguyen Duy Khanh**
- Room **101**, Science Research Building - Campus B, Mien Tay Construction University
  - *Opening session: 7:30; Coffee break (08:30-08:40)*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	Invited talk S1-01-I Assoc. Prof. Le Vu Tuan Hung *(VNUHCM-US, Vietnam)*	The high performance SERS substrate based on semiconductor and nano nanoparticles metal for detecting banned chemical trace in food, drug, and cosmetic.
	Invited talk S1-02-I Prof. Chi-Hsien Huang *(Ming Chi University of Technology, Taiwan)*	Biosensors fearuting an atomic layered graphene oxide/graphene composite
	Invited talk S1-03-I Assoc. Prof. Nguyen Hoang Nam *(University of Science, VNU Hanoi, Vietnam)*	Preparation and Biomedical application of Iron-based functional nanoparticles
	Oral S1-01-O Thi Kim Thao Nguyen, Van Tuan Le and Luong Hong Phuoc Vo	Application of MIKE 21/3 Coupled Model FM for selecting a suitable coastal protection scheme for Hiep Thanh commune, Tra Vinh province (Vietnam)
Coffee break		

Oral S1-02-O Xuan Dung Tran, Anh Ha Le and Hong Phuoc Vo Luong	Applied study of hydrodynamic model on coastal area with mangrove forest
Oral S1-03-O Thanh Minh Nguyen, Chung Tran and Hong Phuoc Vo Luong	Modeling the trajectory of microplastics in the estuary of Hau River using the open-source OpenDrift model
Oral S1-04-O Duc Anh Nguyen and Hong Phuoc Vo Luong	Forecasting and assessing water demand and rice production in an giang in 2024 by using the cropwat and oryza models
Oral S1-05-O Duy Thanh Cu, Meng-Fu Chi and Chien-Cheng Kuo	A Novel Approach to Semiconductor Manufacturing Equipment Corrosion Protection: Fluoride Passivation of Y_2O_3 and YAG Films
Oral S1-06-O Huy Kim Nhat, Thuy Doan Khanh Huynh, Fan-Ching Chien and Kun-Yu Lai	DNA Test Using Nitride Surface-Enhanced Raman Spectroscopy and Machine Learning
Oral S1-07-O Thuy Doan Khanh Huynh, Huy Kim Nhat, Fan-Ching Chien and Kun-Yu Lai	Cancer Diagnosis with Human Blood Plasma Using Nitride Surface-Enhanced Raman Spectroscopy

POSTER PRESENTATION: S1.01-P, S1.02-P, S1.03-P, S1.04-P, S1.05-P.

INVITED TALK (Code: S1-01-I)

The high performance SERS substrate based on semiconductor and nano nanoparticles metal for detecting banned chemical trace in food, drug, and cosmetic

Nguyen Huu Trong, Le Thi Minh Huyen and Le Vu Tuan Hung

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Speaker: Assoc. Prof. Le Vu Tuan Hung

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Abstract

In this work, the high performance SERS substrate based on a combination of semiconductor and metal nanoparticles heterojunction for detection the banned chemical residues in food, drug or cosmetic is studied. The role of semiconductor for charge transfer in chemical mechanism (CM), metal nanoparticles for surface plasmon resonance in electromagnetic (EM) mechanism are thoroughly investigated. Semiconductors include ZnO nanorods, ZnO doped (AZO, IAZO), MoOx... and nanoparticles include Ag and Au. The effect of adsorption between organic molecules on SERS substrate is also studied. The surface morphology, structure, defect, optical and electrical properties of SERS are investigated by scanning electron microscopy (SEM), Raman spectroscopy, ultraviolet-visible spectroscopy (UV-Vis), and Hall measurement. The results indicate that this heterojunction showed good behavior in crystallinity, highly effective surface area, and high conductivity. Furthermore, the Ag or Au NPs distribute uniformly on the SERS substrate and created good “hot-spots”. The SERS substrate used to detect Rhodamine 6G (R6G) and organic molecules enhances strongly the Raman due to both EM and CM.

INVITED TALK (Code: S1-02-I)

Biosensors fearuting an atomic layered graphene oxide/graphene composite

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Abstract

To balance the benefits of G and GO in sensing applications, we developed a composite of GO and G through low-damage plasma treatment (LDPT) to functionalize bilayer graphene (BLG). This process selectively oxidizes only the top layer of BLG, leaving the bottom layer intact, achieving atomic-layer oxidation. The GO top layer provides active sites for stable covalent bonding with biorecognition elements, while the G bottom layer acts as a sensitive transducer.Using this GO/G composite, we created chemiresistive, electrochemical, and transistor-based biosensors for miRNA-21, a cancer biomarker. Additionally, we developed an electrochemical biosensor for antibiotic detection and a transistor-based sensor for detecting p-tau217 protein, a biomarker for Alzheimer's disease. Our results highlight the significant potential of GO/G-based biosensors for early diagnosis.

INVITED TALK (Code: S1-03-I)

Preparation and Biomedical application of Iron-based functional nanoparticles

Nguyen Hoang Nam, Luu Manh Quynh, Hoang Van Huy, Phi Thi Huong and Nguyen Hoang Luong

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Abstract

Various types of iron-based functional nanoparticles were studied to synthesize including the combination with plasmonic and semmiconductor nanoparticles. Magnetic properties are the most important properties of iron-based nanoparticles in biomedical applications, but they are also influenced by and were investigated with other properties of functional nanoparticles. The report discusses various methods to synthesize iron-based nanoparticles, emphasizing the important of size, shape, and surface properties in determining their biomedical efficacy. In following, the in vitro applications of those iron-based nanoparticles are discussed. Finally, the report concludes with future perspectives, stressing the need for further studies to overcome challenges and fully harness the potential of iron-based nanoparticles in clinical settings.

ORAL PRESENTATION (Code: S1-01-O)

Error! Reference source not found. *Application of MIKE 21/3 Coupled Model FM for selecting a suitable coastal protection scheme for Hiep Thanh commune, Tra Vinh province (Vietnam)*

Thi Kim Thao Nguyen (Faculty of Physics and Engineering Physics University of Science, Ho Chi Minh City, Vietnam), Van Tuan Le (Institute of Coastal and Offshore Engineering) and Luong Hong Phuoc Vo (Faculty of Physics and Engineering Physics University of Science, Ho Chi Minh City, Vietnam).

Abstract

Coastal erosion in Tra Vinh province and the Mekong Delta region is becoming increasingly severe due to various factors, among which hydrodynamic conditions (tides, waves, river and sea currents) play a crucial role. This study utilizes the MIKE 21/3 Coupled Model FM to assess the effectiveness of two coastal protection scheme options for the coastal area of Hiep Thanh commune, Tra Vinh: reinforced concrete revetment (Option 1) and hybrid revetment (trees branch fences, geotube, and perforated breakwater - Option 2). The results indicate that Option 1 provides better protection for the existing shoreline. However, Option 2 demonstrates superior performance in wave attenuation and beach nourishment, with the ability to reduce wave height approaching the shore by up to 60%. Option 2 also contributes to erosion reduction and shoreline lowering during the Northeast monsoon season (high sea levels and strong waves). This study provides a scientific basis for selecting a suitable coastal protection scheme for Hiep Thanh commune and can serve as a reference for areas with similar natural conditions.

ORAL PRESENTATION (Code: S1-02-O)

Error! Reference source not found. *Applied study of hydrodynamic model on coastal area with mangrove forest*

Xuan Dung Tran (University of Science, VNU-HCM), Anh Ha Le (University of Science, VNU-HCM) and Hong Phuoc Vo Luong (University of Science, VNU-HCM).

Abstract

The coastal areas play an important role for humans and life, providing economic resources such as fisheries, tourism, and transportation, while also regulating the climate and maintaining biodiversity. As a region with strong interactions of hydrodynamic factors between rivers and the sea, research on coastal areas is essential for maintaining its current state and protecting the coastal areas from erosion, as well as the impacts of climate change and sea-level rise. Nowadays, with the development of technology and enhanced computing capabilities, the research method using simulation models is widely used. In this study, we have developed a hydrodynamic model that can be applied

to calculate and simulate for the coastal and mangrove forest areas. The finite volume method combined with the HLL scheme is used to ensure stability and conservation of the model. The simulation results provide an overview of the hydrodynamic regime in the study area. The characteristics of the water flow in the mangrove forests also illustrate its role in protecting the coastline, reducing erosion, and accumulating sediment, thereby expanding coastal areas.

ORAL PRESENTATION (Code: S1-03-O)

Error! Reference source not found. ***Modeling the trajectory of microplastics in the estuary of Hau River using the open-source OpenDrift model***

Thanh Minh Nguyen (University of Science, Ho Chi Minh City; Southern Regional Hydrometeorological Center, Ho Chi Minh City,), Chung Tran (University of Science, Ho Chi Minh City; Pacific Primary and High School, Ho Chi Minh City) and Hong Phuoc Vo Luong (University of Science, Ho Chi Minh City; Vietnam National University, Ho Chi Minh City).

Abstract

Plastic does not decompose but breaks into smaller pieces under the influence of ultraviolet rays and mechanical processes, unlike other pollutants that enter the ocean. Plastic pollution is is one of the most noticeable aspects of ocean pollution. When combined with other stressors such as climate change and resource overexploitation, it can result in much greater damage than when considered individually. Estimates of the fate and distribution of microplastics in riverine and ocean environments can be determined through modeling and direct measurements. The study aims to set up the PlastDrift tool in the OpenDrift software package to simulate the trajectories and fate of microplastics from the coastal waters of the estuary of Hau River (Mekong delta) to the East Sea. The wave regime in the area will dominate the plastic transport path, so we will use the open-source tool DNORA to dynamically downscale the ERA5 reanalysis data by applying the spectral wave model SWAN. Bathymetry data from the GEBCO database in 2023 will be used. The results from hypothetical scenarios involving different wind and wave conditions will provide an overview of the paths of microplastics and consider the possibility of their stranding in nearby coastal areas.

ORAL PRESENTATION (Code: S1-04-O)

Error! Reference source not found. ***Forecasting and assessing water demand and rice production in an giang in 2024 by using the cropwat and oryza models***

Duc Anh Nguyen (University of Science, Ho Chi Minh City; Vietnam National University, Ho Chi Minh City.) and Hong Phuoc Vo Luong (University of Science, Ho Chi Minh City; Vietnam National University, Ho Chi Minh City.).

Abstract

In early 2024, saltwater intrusion in the Mekong Delta was at a higher level than the average. During February-March 2024, the Mekong Delta region experienced 3 periods of high saltwater intrusion. The main cause of drought and saltwater intrusion in the Mekong Delta was initially due to the influence of the El Niño phenomenon, so from the beginning of 2024, the Mekong Delta region had almost no rainfall (60-95% below normal), with prolonged sunny days causing a large amount of surface water stored in fields, canals, rivers, and lakes to evaporate. At the same time, the water source from the upstream Mekong River to the Mekong Delta was lower than average, combined with the spring tide period, pushing saltwater deep into the rice fields. This situation seriously affected people's lives and agricultural production. The study aims to predict evapotranspiration and water demand using the CROPWAT 8.0 model in combination with simulating the growth and development of rice crops in An Giang province by utilizing the ORYZA model. The study will be conducted for the three main rice growing seasons, including the Winter-Spring, Summer-Autumn, and Autumn-Winter seasons, with a rice variety that has a 95-100 day growth duration. To forecast for 2024, drought data from 2019 was used with continuously high hot temperatures, 0.5° C higher than that in 2019 and no rain from January to May in 2024. According to the model forecasts, if the dry weather conditions and drought continue to intensify, combined with saltwater intrusion and a reduced freshwater supply from upstream, there is a high likelihood of severe impacts on agricultural activities, particularly for the Summer-Autumn crop season.

ORAL PRESENTATION (Code: S1-05-O)

Error! Reference source not found. *A Novel Approach to Semiconductor Manufacturing Equipment Corrosion Protection: Fluoride Passivation of Y_2O_3 and YAG Films*

Duy Thanh Cu (National Central University, NCU Taiwan), Meng-Fu Chi (National Central University, NCU Taiwan) and Chien-Cheng Kuo (National Central University, NCU Taiwan).

Abstract

The semiconductor manufacturing equipment market is essentially driven by the need for high-quality corrosion-resistant coatings in order to deliver longer durability and better performance. This study presents a new method to improve the corrosion-resistive performance of yttrium oxide (Y_2O_3) and yttrium aluminum garnet (YAG) thin films by generating fluoride-passivated layers. The YAG and Y_2O_3 thin films were deposited on B270 glass substrates using the ion-assisted electron beam evaporation system. Growth conditions (120V, 140 V, and 160 V ion source voltage / constant current: 3A) were controlled to improve film density and decrease surface roughness. Subsequently, the films were plasma etched with CF_4/O_2 to form a fluorine-containing passivation layer. Etching was carried out with a microwave power of 1500 W by using different gas ratios (CF_4: O_2: Ar = 90 sccm: 15 sccm: 30sccm) for durations of 2, 4, and 6 hours. The most

important discovery was the generation of a new fluorine-based passivation layer, as shown by XPS for etched films. This layer markedly improved the corrosion resistance properties of the films. Fluorine content in the passivation layer enhanced also its density and resulted in smoother surface topography contributing to enhancing the overall corrosion resistance of the prepared film. This provides the opportunity to use such findings in order to fine-tune deposition conditions and study further dopant elements for even higher film performance.

ORAL PRESENTATION (Code: S1-06-O)

Error! Reference source not found. *Recent advances in half-Heusler thermoelectrics*

Phuoc Huu Le (Center for Plasma and Thin Film Technologies, Ming Chi University of Technology, New Taipei City, Taiwan).

Abstract

Half-Heusler (HH) compounds have attracted increasing research interest owing to their promising thermoelectric (TE) properties working at moderate temperatures and the intriguing non-trivial topological semimetal properties. This review study introduces the background and fundamental aspects of HH thermoelectrics such as nominal formula, rule for stable compounds, the selected state-of-the-art HH TE bulks (e.g., Nb0.55Ta0.40Ti0.05FeSb, Sb-doped NiTi0.50Zr0.25Hf0.25Sn, p-type Zr0.5Hf0.5CoSn0.8Sb0.2, Ti2FeNiSb2). It also presents some demonstrated routes for the enhanced thermoelectric properties of HH TE compounds such as doping and alloying, double half-Heusler, and nanoprecipitation approaches. Among 1525 papers on HH thermoelectrics, only ~42 papers (below 3% of total papers in the field) are about HH TE thin films. Magnetron sputtering is the most popular technique for preparing HH thin films, and the current status of HH TE thin film studies will be presented. Finally, the author will present the possible issues, challenges, and prospects of HH TE thin films.

ORAL PRESENTATION (Code: S1-07-O)

Error! Reference source not found. *DNA Test Using Nitride Surface-Enhanced Raman Spectroscopy and Machine Learning*

Huy Kim Nhat (National Central University), Thuy Doan Khanh Huynh (National Central University), Fan-Ching Chien (National Central University) and Kun-Yu Lai (National Central University).

Abstract

In the landscape of cancer diagnostics, the emergence of circulating tumor DNA (ctDNA) has heralded a new era of precision medicine. To identify specific kinds of ctDNA, surface-enhanced Raman spectroscopy (SERS) has generated significant interest as an ability to categorize the samples with unprecedented sensitivity and specificity. However, due to the

non-uniformity of agglomeration of biological molecules on SERS substrates, the observed SERS signals can be variated within several factors that generates issues of repeatability, resulting in the mismatches of sample classification. In this study, we examine the relevant information of complex and very similar Raman spectra of ctDNAs by using our constructed Principle Component Analysis (PCA) processing algorithm. Four types of ctDNA were classified with the accuracy above 70 %. Our results demonstrate that combining SERS and PCA is a promising tool for ctDNA classification.

POSTER PRESENTATION (Code: S1-01-P)

Error! Reference source not found. *Evaluation of Raman signal enhancement through charge transfer between molecules and silver nano particles on SERS substrates*

Vo Huu Trong (Ho Chi Minh City University of Science), Le Vu Tuan Hung (Ho Chi Minh City University of Science), Tran Thi Phuong Thoa (Ho Chi Minh City University of Science), Nguyen Xuan Mai (Ho Chi Minh City University of Science), Truong Tran Nhat Vy (Ho Chi Minh City University of Science), Nguyen Hoang Long (Ho Chi Minh City University of Science), Le Thi Thu Hong (Ho Chi Minh City University of Science), Nguyen Huu Ke (Ho Chi Minh City University of Science) and Dao Anh Tuan (Ho Chi Minh City University of Science).

Abstract

In SERS analysis technique, Raman signal enhancement is the most important, it mainly relies on two mechanisms: electromagnetic (EM) and chemical enhancement mechanism (CM). Besides the EM, which plays a key role on Raman signals enhancement and has been studied for a long time, the CM is increasingly receiving attention. This report investigates the critical role of CM including the mechanism of adsorption of molecules on the surface of silver particles, the charge transfer between SERS semiconductor thin film with nano silver particles and molecules. First, the silver nano particles in nano colloids were prepared by centrifugation method, then silver nano colloids were mixed and centrifuged with molecules with different concentrations to increase the adsorption and binding capacity. After that, these mixtures were dripped down to SERS substrates fabricated by magnetron dc sputtering. The results showed that the adsorption of molecules and silver nano particles significantly affects the Raman signal enhancement. In addition, the charge transfer of SERS substrate, silver nano particles with different molecules were demonstrated. This method could detect R6G and pharmaceutical ingredients in cosmetics with extremely low concentration.

POSTER PRESENTATION (Code: S1-02-P)

Error! Reference source not found. *Development of Anisotropic Gold nanoparticles doped Flexible Substrate for Microplastics SERS Detection*

Tham T. H. Nguyen (Laboratories of Saigon Hi-tech Park), Tuan V. Huynh (Faculty of Physics and Engineering Physics, VNUHCM, University of Science), Uyen V. P. Pham (Laboratories of Saigon Hi-tech Park), Ngoc B. Nguyen (Laboratories of Saigon Hi-tech Park), Ly H. Truong (Laboratories of Saigon Hi-tech Park), Thang X. Trinh (Laboratories of Saigon Hi-tech Park), Vinh Q. Lam (Vietnam National University, Ho Chi Minh City) and Phat T. Huynh (Laboratories of Saigon Hi-tech Park).

Abstract

Microplastics are tiny plastic particles smaller than 5 millimeters which degrade from commercial plastics. As a pollutant, microplastics has become a global threat for ecosystems nowadays requiring the development of advanced detection techniques. There are many physical and chemical analytical methods for microplastics such as visual analysis, Raman spectroscopy, dynamic light scattering, scanning electron microscopy, Fourier-transform infrared spectroscopy, chromatography. In this report, we introduce a simple method to detect microplastics based on surface-enhanced Raman scattering (SERS). Herein, gold nanostars (anisotropic gold nanoparticles) is doped in filter paper as flexible SERS substrate. Polystyrene particles, one of main microplastics pollution, is used as substrate average size of 10 μm. Raman spectra of polystyrene microplastics obtained using excitation wavelengths of 532 nm (DeltaNu Advantage 532). Through this benchtop instrument, the flexible SERS substrate for polystyrene particles could be detected at low concentrations as 10 μg/mL, and maximum enhancement factors (EF) can be achieved up to 300.

POSTER PRESENTATION (Code: S1-03-P)

Error! Reference source not found. *Fabricate a high-frequency power generator for magnetic curing applications*

Huỳnh Văn Giang (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Nguyễn Thanh Danh (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Trần Quang Nguyên (https://www.uit.edu.vn), Trần Kim Chi (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Lê Thụy Thanh Giang (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science) and Trần Quang Trung (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science).

Abstract

Among epoxy curing methods, Adhesives curing using alternating magnetic fields is a completely new method that allows curing epoxy from the inside out by the rotation of the magnetic moment of heat-generating nanoparticles connecting the ligands in the epoxy. Meanwhile, methods such as heat curing, UV, etc. perform the curing process

from the outside in, limited to specific materials and inconvenient operations. In this study, we build a high-frequency generator system with different frequencies (50khz - 1000KHz) for the purpose of applying to magnetic curing. Experimental results show that the frequency of 400KHz is very effective in the curing process of epoxy through ferromagnetic nanoparticles at a rate of 0.5% by weight.

POSTER PRESENTATION (Code: S1-04-P)

Error! Reference source not found. *Synthesis of Gold Nanorods by Seed-Mediated Method*

Chi Tran (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Vy Nguyen (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Anh Le (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Giang Huynh (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Danh Nguyen (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Nguyen Tran (University of Information Technology), Thanh Nguyen (Laboratory of Advanced Materials), Trung Tran (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science) and Giang Le (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science).

Abstract

In the nanotechnology field, the production of gold nanorods plays a crucial role due to their wide range of applications in areas such as medicine, electronics, and chemistry. Methods such as using tetrachloroauric acid, sodium borohydride, ascorbic acid, cetyltrimethylammonium bromide, and silver nitrate in the seed-mediated growth process have become popular for creating gold nanostructures. Research on the influence of seed aging time and AgNO3 concentration on the formation of gold nanorods is necessary to optimize the production process. The results show that seeding for more than 16 hours can cause gold particle aggregation, adversely affecting nanorod formation. The variation in AgNO3 concentration also impacts the size of the gold nanorods, evidenced by a redshift at the 730nm absorption peak with increasing AgNO3. Therefore, strict control of seed aging time and adjustment of AgNO3 concentration are crucial steps to achieve the desired size and shape of gold nanorods, paving the way for new approaches in producing gold nanostructures with optimal properties for specific applications.

POSTER PRESENTATION (Code: S1-05-P)

Error! Reference source not found. *Synthesis of gold nanorods for surface enhanced Raman spectroscopy in the detection of rhodamine 6g*

Thi Hoang Lien Vuong (Department of Applied Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM.), Duy Khanh Nguyen (Department of Applied Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM.), Vu Tuan Hung Le (Department of Applied Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM.) and Van Ngoc Le (Department of Applied Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM.).

Abstract

This study presents a detailed methodology for the synthesis of gold nanorods (AuNRs) tailored for surface-enhanced Raman spectroscopy (SERS) applications, specifically targeting the detection of Rhodamine 6G (R6G). Gold nanorods were synthesized using a seed-mediated growth method, optimized to produce nanorods with uniform size and shape, essential for consistent SERS performance. The synthesized AuNRs were characterized using UV-Vis spectroscopy and transmission electron microscopy (TEM) to confirm their optical properties and morphological features. The SERS activity of the AuNRs was evaluated by detecting R6G, a commonly used dye and Raman reporter molecule. Results demonstrated that the synthesized AuNRs provided significant enhancement of the Raman signal of R6G with a laser of 785 nm, showcasing their potential as reliable SERS substrates. This enhancement is attributed to the localized surface plasmon resonance (LSPR) properties of the AuNRs, which were finely tuned through controlled synthesis parameters. This study underscores the importance of precise nanorod synthesis in achieving high sensitivity in SERS-based detection methods with a 785 nm laser. It opens avenues for the development of advanced diagnostic tools using gold nanostructures.

Session 2. Medical Physics and Nuclear Engineering

- Chair and Co-chairs:
  - . **Prof. Takekazu. Ishida** (Osaka Metropolitan University, Japan)
  - . **Dr. Vo Hong Hai** (VNUHCM- University of Science, Vietnam)
- Secretary: **MSc. Hua Thi Hoang Yen**
- Room **102**, Science Research Building - Campus B, Mien Tay Construction University
  - *Opening session: 7:30*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	Invited talk S2-01-I Dr. MD Abdul Momin *(University of Pittsburgh, United States)*	Toward the Fabrication of Wearable Devices for Biomedical Applications: Human Activity and Cardiovascular Monitoring
	Invited talk S2-02-I Asst. Prof. Vu The Dang *(Osaka Metropolitan University, Japan)*	Transmission of Metals with Negative and Positive Scattering Length Density for Neutrons Using CB-KID Sensor
	Oral S2-02-O Yen Thi Hoang Hua and Liet Dang Van	Denoising Techniques for Enhanced Mammogram Analysis
Coffee break		
	Oral S2-03-O Thanh Nhan Huynh, Hoang Minh Le, Duy Thong Nguyen, Thien Thanh Tran and Van Tao Chau	Use Machine Learning to classify materials based on gamma scattering spectra

POSTER PRESENTATION: S2.01-P, S2.02-P

INVITED TALK (Code: S2-01-I)
Toward the Fabrication of Wearable Devices for Biomedical Applications: Human Activity and Cardiovascular Monitoring

Md Abdul Momin [1,*]

[1] *Department of Bioengineering, Swanson School of Engineering, University of Pittsburgh, 3700 O`Hara St. Pittsburgh, PA 15261, USA*

** Corresponding email: mdm201@pitt.edu*

Abstract. The growing demand for personalized and continuous health monitoring has driven significant advancements in wearable biomedical devices. Human activity can be precisely monitored and detected using custom algorithms, enabling enhanced real-time activity recognition systems even in indoor environments. Additionally, by integrating piezoelectric sensors in shoes, these devices can generate power through movement, supporting energy-efficient, self-sustained wearable applications. This talk explores the latest innovations in wearable sensor technology for human activity and cardiovascular monitoring, highlighting the role of micro/nano fabrication, advanced materials, and integrated sensor systems. Wearable devices, such as load cells, foot pressure sensors, and pressure-sensitive textiles, now offer highly sensitive, real-time insights into physical activities like walking, running, and balance assessment, with applications in sports, rehabilitation, and daily health tracking. [1-3].

One emerging frontier in wearable technology is cardiovascular monitoring, particularly through compact, user-friendly devices that provide cuffless continuous blood pressure (BP) tracking. The development of a wearable BP monitoring ring exemplifies how advanced fabrication techniques, including precision 3D printing and tailored material selection, enable miniaturized yet powerful sensors for cardiovascular health. This approach combines real-time data collection and interdisciplinary design to create reliable, responsive, and accessible health solutions. By integrating engineering and biomedical insights, these wearable devices open new avenues for proactive health management and underscore the potential of technology to support wellness and clinical applications.

INVITED TALK (Code: S2-02-I)

Transmission of Metals with Negative and Positive Scattering Length Density for Neutrons Using CB-KID Sensor

The Dang Vu[1,2], Hiroaki Shishido[3], Kazuya Aizawa[2], Takayuki Oku[2], Kenichi Oikawa[2], Masahide Harada[2], Kenji M. Kojima[4], Shigeyuki Miyajima[5], Tomio Koyama[1], Kazuhiko Soyama[2], Mutsuo Hidaka[6], Soh Y. Suzuki[7], Manobu M. Tanaka[8], Masahiko Machida[9] and Shuichi Kawamata and Takekazu Ishida[1].

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Abstract

Neutrons beams interact with nuclei directly [1] but cover the wide range of neutron energies in spectroscopy. This is in contrast with the fact that the X-rays interact with electron clouds of matter in a monochromatic wavelength [2]. In addition, neutrons behave not only as waves but also as particles. The scattering length of neutron beams tend to sense low-atomic-number elements. Muti-wavelength analysis of pulsed neutrons makes it possible to reveal versatile properties of materials. We proposed a current-biased kinetic inductance detector (CB-KID) as a novel superconducting detector to construct a neutron transmission imager. The characteristics of a superconducting neutron detector have been systematically studied to improve a spatial resolution down to 10 μm in transmission imaging [3]. The practical usefulness of CB-KID was tested with various samples in view of good spatial linearity between the Gd-islands' sizes over various different-sized samples [4], narrow areas Bragg-edge detection [5], and the nuclear-resonance-dip imaging of SmSn mosaic structure [6]. The energy-resolving neutron transmission spectra can cover a wide region from 1 meV to 500 keV with CB-KID [7].

In this study, we applied our neutron detector to investigate the negative and positive neutron coherent scattering length density (SLD) materials where neutron transmission of copper metal of positive SLD and titanium metal of negative SLD. It curved emitted beam to opposite side with a same angle of incident beam at corner of samples. Therefore, we found that there is a difference in behavior of neutrons transmission images at edges of two samples. It demonstrates that neutrons worked as a wave, with different refractive indexes. Fig. 1(a) shows that in case positive SLD

of Cu, the refraction beams construct a positive peak outside of the sample edge and a negative peak near edge of the sample edge. Contrastingly, the reflection beams construct negative and positive peaks inside of the sample edge, instead of the refraction beams because of negative of SLD in fig. 1 (b). The intensity of peaks depends on the wavelength λ of neutron beams. Figs. 1 (c), (d) are line profile curves of experimental neutron transmission images of Cu and Ti, where a position of the edge is determined by comparing line profiles of SEM image with transmission images at the same position. Understanding of this characteristic edge profile of material will be useful in analyzing the composite system consisting positive and negative refractive-index materials using pulsed neutrons in the future.

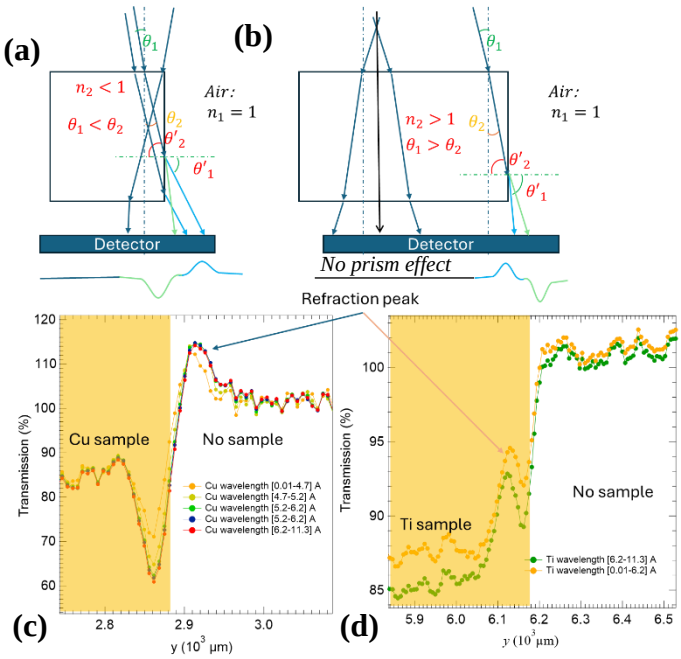

Fig. 1. Neutron transmission of Cu and Ti near the sample edge as a function of position, where the refraction peak or the refraction dip depends on relevant wavelengths

Keywords: Neutron detector, CB-KID, negative refraction, neutron transmission, positive refraction.

References

[1] Tengattini A, *et al., Nucl Instrum Methods Phys Res A* 2020; **968** 163939.
[2] Ren Y and Zuo X, *Small Methods* 2018; **2** 1800064.
[3] Vu T D, et al., *J Phys Conf Ser* 2020; **1590** 012036.
[4] Vu T D, et al., *Nucl Instrum Meth Phys Res A* 2021; **1006** 165411
[5] Vu T D, et al., *J Phys Conf Ser* 2022; **2323** 012028
[6] Shishido H, et al., *J Phys Conf Ser* 2022; **2323** 012029
[7] Vu T D, *et al., IEEJ Transactions on Electrical and Electronic Engineering*; **19** (2024) 1888-1894

ORAL PRESENTATION (Code: S2-02-O)

Error! Reference source not found. ***Denoising Techniques for Enhanced Mammogram Analysis***

Yen Thi Hoang Hua (University of Science, VNU-HCM, Ho Chi Minh City, Vietnam) and Liet Dang Van (University of Science, VNU-HCM, Ho Chi Minh City, Vietnam).

Abstract

Introduction Mammogram noise significantly impacts image quality, thereby hindering early breast cancer detection. To address this challenge, this paper explores various denoising techniques. The importance of accurate breast mass detection for early diagnosis is emphasized by this study. Methodology One key contribution is the development of a hybrid approach that combines image enhancement through mathematical morphology with wavelet coefficient modeling using a bivariate distribution function. This two-step process aims to achieve a balance between noise removal and detail preservation. We introduce a novel denoising and enhancing method based on the morphological transformation. Additionally, a statistical bivariate model within the stationary wavelet transform (SWT) framework is introduced. This model incorporates a bivariate shrinkage estimator specifically designed for mammogram smoothing and offers advantages in data smoothing compared to existing techniques due to its ability to exploit the dependency between wavelet coefficients. Results Our approach outperforms existing techniques (Visu Shrink, Sure Shrink, Bayes Shrink) in terms of PSNR (Peak Signal-to-Noise Ratio), MSE (Mean Squared Error), and SSIM (Structural Similarity Index Measure) evaluation metrics. This method achieves competitive detection performance on benchmark datasets despite the complexity of breast masses and their surroundings. Conclusion and Discussion Ultimately, it aims to improve image quality and enhance crucial feature detection, potentially leading to more accurate diagnoses and improved patient outcomes.

ORAL PRESENTATION (Code: S2-03-O)

Error! Reference source not found. ***Use Machine Learning to classify materials based on gamma scattering spectra***

Thanh Nhan Huynh (University of Science, VNU-HCM), Hoang Minh Le (University of Science, VNU-HCM), Duy Thong Nguyen (University of Science, VNU-HCM), Thien Thanh Tran (University of Science, VNU-HCM) and Van Tao Chau (University of Science, VNU-HCM).

Abstract

In this study, Machine learning is used to classify materials based on gamma scattering spectrum. The Monte Carlo method is used to create simulated scattering spectral data sets for material samples Al, Si, Ca, Ti, Mn, Fe, Co, Cu, Zn and C45 steel. The simulated material sample has a cylindrical shape with a fixed outer diameter with a thickness

varying from 1mm to 50mm. In Machine learning, Random Forests algorithm is used to train and evaluate models. The results show that the correct prediction rate increases from 75% to 95% when increasing the accuracy of input data from 1% to 0.1%.

POSTER PRESENTATION (Code: S2-01-P)

Error! Reference source not found. ***In situ gamma ray spectrometry for environmental monitoring using full spectrum analysis***

Hong Huynh (University of Science, VNU-HCM), Thao Tran (University of Science, VNU-HCM), Ngân Thy Trương Hữu (University of Science, VNU-HCM), Thắng Nguyễn (University of Science, Vietnam National University Ho Chi Minh City), Khang Tran (The Woodstock Academy), Hoa Lang Trinh (UNIVERSITY OF SCIENCE) and Hao Le (Nuclear Technique Laboratory, University of Science, VNU-HCM).

Abstract

In this study, a method using the full spectrum analysis (FSA) technique has been developed and it is able to provide rapid determination of activity concentrations for in situ measurement in the soil environment. The standard spectra construction procedure was conducted for the FSA method by using in situ gamma spectra to determine the standard spectra of uranium, thorium and potassium. The optimal activity concentration values were derived by reproducing the in situ spectrum using a linear combination of the standard spectra. The FSA method was initially tested in the laboratory, using reference spectra acquired in soil samples of known activity concentrations. The FSA method was applied to estimate the activity concentrations for in situ measurement in the soil environment in different sites.

POSTER PRESENTATION (Code: S2-02-P)

Error! Reference source not found. ***Applying the WKB approximation method to calculate the cluster decay half-life of certain heavy nuclei with even numbers of protons and neutrons***

Nguyên Thi Huyen Nga (University of natural sciences), Le Hoang Chien (University of natural sciences), Nguyen Tri Toan Phuc (University of natural sciences) and Chau Van Tao (University of natural sciences).

Abstract

This paper investigated the cluster decay half-life of some heavy even-even nuclei in the ground state. To find the cluster decay half-life of some nuclei, the paper applied the semiclassical WKB method with the effective potential, which includes the Woods-Saxon nuclear potential, Coulomb potential, and centrifugal potential. The calculated results have been compared with the results of other theoretical models and experimental results. From the calculated results, we pointed out that the WKB approximation method with the

Woods-Saxon nuclear potential has been successfully used to calculate the cluster decay half-life of heavy nuclei

PARALLEL SESSION

Session 3. Semiconductor Technologies, Materials, Device and Related

- Chair and Co-chair:
  - **Assoc. Prof. Vu Thi Hanh Thu** (VNUHCM-University of Science, Vietnam)
  - **Prof. Satoru Noguchi** (Osaka Metropolitan University, Japan)
  - .Secretary: **Tran Kim Chi-MSc** (VNUHCM-University of Science, Vietnam)
- Room **303**, Science Research Building - Campus B, Mien Tay Construction University
  - *Opening session: 7:30 ; Coffee break:*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	Invited talk S3-01-I Prof. Satoru Noguchi (*Osaka Metropolitan University, Japan)*	Development of Pulsed Magnetic Field Environment up to 50T below 1K
	Invited talk S3-02-I Asst. Prof. Dr. Gaopeng Xue *(Harbin Institute of Technology, China)*	Glass-Based Micro-Hotplate with Low Power Consumption and TGV Structure
	Invited talk S3-03-I Assoc. Prof. Dr. Le Huu Phuoc (*Ming Chi University of Technology,Taiwan*)	Recent advances in half-Heusler thermoelectrics
	Invited talk S3-04-I Assoc. Prof. Dr. Tran Quang Trung *(VNUHCM- University of Science, Vietnam)*	Faculty of Physics and Engineering Physics – Developing the field of semiconductor technology for training and research
Coffee break		

Oral S3-01-O Nhân Nguyễn Trọng, Quỳnh Trang Tôn Nữ, Gia Bảo Nguyễn Trần and Hạnh Thu Vũ Thị	Fabrication and Research the AgNCs/AuNSs@PP Nanostructures for SERS Platform
Oral S3-02-O Nguyen Tran, Khanh Pham, Hieu Pham, Danh Nguyen, Giang Huynh, Bao Nguyen and Trung Tran	Building and programing of scara robot wafer manipulation for the sample manufacturing process using STM32 microcontrollers
Oral S3-03-O Anomalous Hall Effect in Co and Co (0001)/TMs interface: first-principles study	Thi Ly Trinh, Bui Trung Kien Nguyen and Duc Cuong Do
Oral S3-04-O Thanh Tan Cuong Mai, Thanh Huy Ho, Nguyen Toan, Chi Nhan Nguyen and Van Hieu Nguyen	The study of heat sink for the optimal power of ThermoElectric Generator (TEGs) in the Aquaponic farm

POSTER PRESENTATION: S3.01-P, S3.02-P, S3.03-P, S3.04-P, S3.05-P, S3.06-P, S3.07-P.

INVITED TALK (Code: S3-01-I)

Development of Pulsed Magnetic Field Environment up to 50T below 1K

Satoru Noguchi, Minori Tsujibayashi, Yuko Hosokoshi, Yasuo Narumi and Masayuki Hagiwara

Speaker: Prof. Satoru Noguchi
Osaka Metropolitan University, Japan
Email: noguchisatoru@omu.ac.jp

Abstract

Ultra-low temperatures, strong magnetic fields, and ultra-high pressures are extraordinary external extreme environments, and new physical properties are always discovered under such extreme environments. Especially, the combination of these multiple extreme environments has been recognized as extremely important as a platform for exploring new physical properties. It is generally possible to measure physical properties down to mK by combining a commercially available superconducting magnet and dilution refrigerator in magnetic fields of up to 20 T. However, the combined development of a pulsed high magnetic field exceeding 20 T and cryogenic temperatures below 1 K has been difficult because of two reasons: one is the risk of ^{3}He loss when the high-field coil breaks down, and the other is that metallic materials cannot be used in the pulsed high field. In this talk, we present the development of the cryostat used in pulsed high-fields that achieves cryogenic temperatures below 1 K without using ^{3}He. It consists of a paramagnetic-salt adiabatic demagnetization section, a superfluid ^{4}He heat transfer tube, and a pulsed high-field application section. The adiabatic demagnetization section and the high-field section must be separated by more than 300 mm to avoid magnetic interference, and good heat conduction between them is ensured by superfluid ^{4}He. Details of the cryostat currently under construction will be given in the talk

INVITED TALK (Code: S3-02-I)

Glass-Based Micro-Hotplate with Low Power Consumption and TGV Structure

Gaopeng Xue, Honglin Qian, Penghong Shi, and Bing Li
School of Mechanical Engineering and Automation, Harbin Institute of Technology, Shenzhen 518055, China

Speaker: Asst. Prof. Dr. Gaopeng Xue
Email: xuegaopeng@hit.edu.cn

Abstract

Achieving low power consumption in MEMS micro-hotplate, as an essential performance indicator, is particularly attractive in MOS gas sensors. Based on the universality of MEMS microfabrication technologies for Si material, Si-film-suspended micro-hotplates are dominantly adopted in current MEMS MOS gas sensors [1]. However, the large thermal conductivity coefficient of Si material is as high as 130 W/(m*K), resulting in a relatively

high power consumption in Si-based MEMS micro-hotplates [2], [3]. This study presents a novel microfabrication approach using anodic bonding and glass thermal reflow to fabricate glass-based micro-hotplates with low power consumption owing to the low thermal conductivity coefficient (1.4 W/(m*K)). The glass-film-suspended micro-hotplate, integrated with through glass via (TGV) structure, is achieved by anodic bonding a glass substrate with a patterned silicon (Si) wafer, followed by thermal reflow of the glass substrate around the patterned Si wafer. TGV structures, wherein conductive Si columns are inserted into the glass substrate, have the potential to replace wire-bonders for electrical interconnection with integrated circuit (IC) boards. The fabricated glass-film-suspended micro-hotplates with ~20 μm thickness demonstrate significantly lower power consumption and higher heating efficiency. Furthermore, our microfabrication approach for precisely patterning glass-based microstructures can be applicable to other glass-based MEMS devices for three-dimensional (3D) integrated microsystems.

INVITED TALK (Code: S3-03-I)

Recent advances in half-Heusler thermoelectrics

Le Huu Phuoc

Speaker Assoc. Prof. Dr. Le Huu Phuoc
(*Ming Chi University of Technology,Taiwan*)
Email: phle@mail.mcut.edu.tw

Abstract

Half-Heusler (HH) compounds have attracted increasing research interest owing to their promising thermoelectric (TE) properties working at moderate temperatures and the intriguing non-trivial topological semimetal properties. This review study introduces the background and fundamental aspects of HH thermoelectrics such as nominal formula, rule for stable compounds, the selected state-of-the-art HH TE bulks (e.g., Nb0.55Ta0.40Ti0.05FeSb, Sb-doped NiTi0.50Zr0.25Hf0.25Sn, p-type Zr0.5Hf0.5CoSn0.8Sb0.2, Ti2FeNiSb2). It also presents some demonstrated routes for the enhanced thermoelectric properties of HH TE compounds such as doping and alloying, double half-Heusler, and nanoprecipitation approaches. Among 1525 papers on HH thermoelectrics, only ~42 papers (below 3% of total papers in the field) are about HH TE thin films. Magnetron sputtering is the most popular technique for preparing HH thin films, and the current status of HH TE thin film studies will be presented. Finally, the author will present the possible issues, challenges, and prospects of HH TE thin films.

INVITED TALK (Code: S3-04-I)

Faculty of Physics and Engineering Physics – Developing the field of semiconductor technology for training and research

Tran Quang Trung
Faculty of Physics and Engineering Physics, University of Science, VNUHCM, Hochiminh city, Vietnam

Speaker: Assoc. Prof. Dr. Tran Quang Trung
(*VNUHCM-University of Science, Vietnam*)
Email: tqtrung@hcmus.edu.vn

Abstract

The Faculty of Physics and Engineering Physics is a pioneer (in the South of Viet Nam) in the field of research and manufacturing of functional material layers prepared by CVD, PVD, solution methods... (with the ability to be applied in practice) serving very effectively in the process of training, education and scientific research. Although there has not been any investment (according to policy) in the field of semiconductor technology, the staff of the Faculty of Physics and Engineering Physics still conducts research in the field of semiconductor technology, and has been building equipment to meet the research requirements in the field of semiconductor technology. As a result, the Faculty of Physics and Engineering Physics has successfully built the most basic equipment in the field of semiconductor technology, gradually improving and developing to effectively serve training and scientific research (applying new materials to specific components).

Keywords: Faculty of Physics and Engineering Physics, functional material, semiconductor technology.

References:

[1] James D. Plummer, Michael Deal, Peter D. Griffin - Silicon VLSI technology_ fundamentals, practice, and modeling-Prentice Hall (2000)
[2] https://phys.hcmus.edu.vn/tin-tuc/nganh-cong-nghe-ban-dan-truong-dai-hoc-khoa-hoc-tu-nhien-hcmus
[3] https://vnuhcm.edu.vn/sinh-vien_33383364/truong-dh-khoa-hoc-tu-nhien-huong-den-dao-tao-thiet-ke-vi-mach-va-cong-nghe-ban-dan/353338303364.html

ORAL PRESENTATION (Code: S3-01-O)

Error! Reference source not found. ***Fabrication and Research the AgNCs/AuNSs@PP Nanostructures for SERS Platform***

Nhân Nguyễn Trọng (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM), Quỳnh Trang Tôn Nữ (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM), Gia Bảo Nguyễn Trần (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM) and Hạnh Thu Vũ Thị (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM).

Abstract

Surface Enhanced Raman Scattering (SERS) method is widely used in detecting banned substances at low concentrations. This study has combined two nanospheres of Au (AuNSs) and nanocubes of Ag (AgNCs) to create the AuNSs/AgNCs film attached in the wall of a centrifuge tube (PP) (AuNSs/AgNCs@PP, leading to a formation of the SERS chip using fabrication methods such as microwave, chemical reduction and centrifugation process. Analytical measurements such as XRD spectra, TEM image, and Raman spectroscopy were evaluated. The results show that the SERS AgNCs/AuNSs@PP sensor was successfully fabricated using a simple pathway that is effective in enhancing plasmonic properties and reducing the nanogaps between the hotspots inside the centrifuge tube. Therefore, this sensor can detect Rhodamin B (RhB) molecules at concentrations lower than 10^-6 M.

ORAL PRESENTATION (Code: S3-02-O)

Error! Reference source not found. ***Building and programing of scara robot wafer manipulation for the sample manufacturing process using STM32 microcontrollers***

Nguyen Tran (Department of IC Design and Hardware, University of Information Technology, VNU-HCM), Khanh Pham (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM), Hieu Pham (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM), Danh Nguyen (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM), Giang Huynh (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM), Bao Nguyen (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM) and Trung Tran (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science, VNU-HCM).

Abstract

Automation of material manufacturing and measurement processes... is an important direction in semiconductor technology which allows to significantly reduce errors, increase accuracy, ... in the fabricating process. In this study, we built a 3-axes SCARA robot to automate for wafer manipulation from the wafer cassette into the thin-film fabricating chambers through vacuum valve doors (load lock). The operating process is controlled by the stepper motors in the robot arm basing on the change of different parameters such as velocity, acceleration, angle, time…. These processes are executed through the STM32 microcontroller on the LabVIEW software platform in real-time. The research is a premier step towards automate the multilayer sample fabricating processes at the laboratory and apply on semiconductor device in next step

ORAL PRESENTATION (Code: S3-03-O)

Error! Reference source not found. *Anomalous Hall Effect in Co and Co (0001)/TMs interface: first-principles study*

Thi Ly Trinh (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh, 70000, Vietnam), Bui Trung Kien Nguyen (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh, 70000, Vietnam) and Duc Cuong Do (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh, 70000, Vietnam).

Abstract

Recent developments of spintronics have focused on utilizing spin currents and magnetism in various classes of materials. Among those the anomalous Hall effect has received a lot of interest owing to intriguing physics and potential applications. Intensive and extensive efforts have been paid to superlattices and/or interfaces between ferromagnetic metal (FM) and heavy metal (HM). In this study, we investigate the intrinsic anomalous Hall conductivity (AHC) in bulk and thin film of Co. Furthermore, TMs capping on Co(0001) is also explored in the framework of density functional theory using the Kubo formula with the Wannier function. The calculated AHC of Co obtained at a value of 449 (Ωcm)-1, which is comparable with previous calculation 477 (Ωcm)-1 . We found that AHC of hcp Co can be increased (or reduced) via hole (or electron) doping, where the key factors are the degeneracy and crossing point near the Fermi level. In Co thin film with 5 ML, we obtain the enhancement of AHC up to 569 (Ωcm)-1. On the other hand, capping TMs (Ta, Pd, Pt) on Co(0001) was found to reduce AHC below 300 (Ωcm)-1.

ORAL PRESENTATION (Code: S3-04-O)

Error! Reference source not found. ***The study of heat sink for the optimal power of ThermoElectric Generator (TEGs) in the Aquaponic farm***

Thanh Tan Cuong Mai (Faculty of Physics - Engineering Physics, VNUHCM-University of Science, Hochiminh City, Vietnam), Thanh Huy Ho (Faculty of Physics - Engineering Physics, VNUHCM- University of Science, Hochiminh City, Vietnam), Nguyen Toan (Tohoku University), Chi Nhan Nguyen (Faculty of Physics - Engineering Physics, VNUHCM- University of Science, Hochiminh City, Vietnam) and Van Hieu Nguyen (IPTC, VNUHCM, Vietnam).

Abstract

This work studies the power energy of TEGs when using other heat sink devices with Al and Cu in the environment of the aquaponic farm to determine the optimal heat sink types. The temperature difference between the water source and the air in aquaponic is transmitted to the cold (T-cold) and hot (T-hot) sides of the TEG component, generating voltages of several tens of mV and currents of several mA. To measure the output voltage of 3TEGs at the same time (by Logger equipment) has collected a lot of data for the operation of TEGs to compare the characteristics of TEGs of the same group and different groups. The I-V characteristic of TEGs according to the linear function y=aX+b has helped classify TEGs into groups when they have the same coefficient a. At that time, the measurement of the electrical capacity of the TEGs was also performed in groups because of the same electrical properties. Investigating TEG with an heat sink comb sharp with Al (instead of cylinder a Cu base), although the light intensity (lux) increased more than 2 times, the voltage level of TEG generated did not increase much or reach saturation level. This shows that each TEG has a maximum and saturated power generation level. The survey also showed that using components that transfer heat from the air to the heat absorbing surface of the TEG, Al is not as good as Cu as well as the results of COMSOL software. The data of TEG power will continue to apply in near future with low-power sensor of IoT circuits for the greenhouse gas reduction.

POSTER PRESENTATION (Code: S3-01-P)

Error! Reference source not found. ***Simulation and Fabrication of Surface Enhanced Raman Scattering (SERS) Substrate based on Au/Ag Nanostructures***

Thuan Phuoc La (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM), Quynh Trang Ton Nu (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM), Gia Bao Nguyen Tran (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM) and Hanh Thu Vu Thi (Bộ môn Vật lý ứng dụng, Khoa Vật lý - VLKT, trường ĐH Khoa học Tự nhiên, ĐHQG-HCM).

Abstract

Tuning and controlling the localized surface plasmon resonance (LSPR) effect between noble metal structures are important in enhancing near-field and far-field resonances. This research has been evaluated the hotspot control of the hybrid plasmon nanostructures of Au and Ag. The three configurations of hotspots created by nanospheres (NSs) and nanocubes (NCs) have been evaluated via the Finite Different Time Domain (FDTD) method. The results showed that the point-facet type exhibits the highest SERS intensity based on the LSPR of Ag and Au. This study has experimental guidance for the development and fabrication of plasmonic materials to achieve LSPR properties and SERS performance with high sensitivity.

POSTER PRESENTATION (Code: S3-02-P)

Error! Reference source not found. *First Principles Calculations Study the Onset of Magnetism in Pd*

Hong Quyet Pham (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh City 70000, Vietnam) and Duc Cuong Do (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh City 70000, Vietnam).

Abstract

Palladium (Pd) metal has been well-known as a transition metal that has the highest Stoner factor (I = 9.87) and Pauli susceptibility [1] among the non-magnetic transition metals. Therefore, it was predicted that Palladium could be turned into a ferromagnet in some circumstances. Several predictions showed that the magnetism of Pd could occur when the Pd is under quantum confinement in 0-dimension nanoparticles or when a small number of layers of Pd thin film were considered [2–3]. In this current study, we systematically study the electronic structure and magnetic properties of different magnetic structures of Pd in either a face-centered cubic (fcc) crystal structure or a thin film structure of Pd by using first principles calculations. The initial findings demonstrated the bulk Pd's ability to be magnetized when various exchange correlations were applied to the Pd structure; e.g., magnetic properties are induced under applying gradient generalized approximation (GGA), while not if applying local density approximation (LDA). On the other hand, it is found that magnetism can be induced in Pd (001) 3 MLs under tensile strain. The symmetry of those structures is analyzed in detail, aiming to provide a deep understanding of the magnetic structure of Pd.

References [1] J. Walter, S. Hara, M. Suzuki & L. S. Suzuki, “Magnetism in Palladium Experimental Results in View of Theoretic Predictions”, book chapter, NATO Science Series (2002). [2] F. Aguilera-Granja, A. Vega, J. Rogan, W. Orellana, and G. García, “Magnetic properties of Pd atomic clusters from different theoretical approaches”, Eur. Phys. J. D 44, 125–131 (2007). [3] S. Bouarab, C. Demangeat, A. Mokrani and H. Dreyssé, “Onset of magnetism in palladium slabs”, Physics Letters A 151, 103 (1990).

POSTER PRESENTATION (Code: S3-03-P)

Error! Reference source not found. ***Intrinsic Spin Hall Effect in Co/Pt superlattice***

Thao Suong Nguyen Thi (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh City 70000, Vietnam) and Duc Cuong Do (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh City 70000, Vietnam).

Abstract

Recent developments of spintronics have focused on utilizing spin Hall effects in various classes of materials. Extensive efforts have been paid to superlattices and/or interfaces from ferromagnetic (FM) metal-heavy metal (HM). Non-negligible spin-orbit coupling in FM/HM is expected to produce the aforementioned spin Hall effect – a generation of transverse spin current by injecting longitudinal charge current in the absence of external magnetic field, which has many potential applications in spintronic devices. In this study, the electronic structure and magnetic properties of Co/Pt superlattice were studied by density functional theory. The intrinsic spin Hall conductivity was explicitly calculated using the tight binding method in the framework of Kubo formula with the combination with the Wannier functions. To understand the contributions to spin Hall conductivity, k-resolved Berry curvature as well as detailed spin orbit coupling band structure will be calculated and discussed in detail in literature.

POSTER PRESENTATION (Code: S3-04-P)

Error! Reference source not found. ***Electronic structure and thermoelectric properties of 2-dimensional semiconductors: A first principles study***

Hai Hung Tran (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh, 70000, Vietnam), Thi Ly Trinh (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh, 70000, Vietnam) and Duc Cuong Do (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM, Ho Chi Minh, 70000, Vietnam).

Abstract

The figure of merit (ZT) of thermoelectric materials can be enhanced by lowering thermal conductivity or/and increasing electrical conductivity. The extremely high ZT of 2-dimensional semiconductor SnSe1 opened a new direction in study of thermoelectricity due to its low thermal conductivity, which, however, is limited to high temperature. Here, we performed the first principles density functional calculations to explore room-temperature thermoelectricity. We consider combination of SnSe with other 2-dimensional semiconductors in kind of superlattices with different period,

whose quantum well structure is expected to increase electrical conductivity by modulation of charge doping at interface. It is expected that the electronic and thermoelectric properties of the superlattice modify with the period of superlattice changes which can lead to the enhancement of thermoelectric properties of the superlattice toward lower temperature.

POSTER PRESENTATION (Code: S3-05-P)

Error! Reference source not found. ***Fabrication surface-enhanced Raman scattering (SERS) substrate based on PSi/ZnO NRs/Ag structure for organic dyes detection***

Pham Thu Uyen (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh city, Viet Nam), Le Hoang Dong Phuong (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh city, Viet Nam), Tran Minh Khoi (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh city, Viet Nam), Dao Anh Tuan (University of Science, Viet Nam National University Ho Chi Minh City) and Nguyen Huu Ke (University of Science, Viet Nam National University Ho Chi Minh City).

Abstract

In this study, 3D hybrid heterostructure have been fabricated using Ag nanoparticles decorated ZnO nanorods over pyramidal silicon arrays (PSi) for Surface Enhanced Raman Scattering (SERS) applications. The PSi/ZnO NRs/Ag structure was prepared by combining of wet etching processes, hydrothermal synthesis and magnetron sputtering method. The phase and the surface of the heterostructure were studied by XRD and Field Emission Scanning Electron Microscope (FESEM), respectively. The SERS performance of the 3D heterostructure was evaluated using Methylene Blue at various concentrations with a detection limit of 1 pM. It is found that the new substrate exhibits good performance in terms of high sensitivity and good reproducibility for surface enhanced Raman scattering. At the optimal condition, the average size of the Ag NPs is about 30 nm and uniform distribution on the surface of the ZnO NRs which are beneficial to the sensitivity of the SERS signal. Our work demonstrates a facile synthesis of 3D SERS heterostructure and sheds light on its superior SERS properties paving ways for wide range of applications in biosensors, detection of harmful chemicals, food adulterations, narcotic detection and many more.

POSTER PRESENTATION (Code: S3-06-P)

Error! Reference source not found. ***Effect of oxygen deficiency on SERS activities of WO3-x films***

Tran Minh Khoi (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam), Pham Thu Uyen (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam), Le Nguyen Khoa (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam), Chau Ngọc Son (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam), Dao Anh Tuan (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam), Nguyen Huu Ke (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam) and Le Vu Tuan Hung (Department of Applied Physics, University of Science, VNU-HCM, Ho Chi Minh, Viet Nam).

Abstract

The oxygen-deficient WO3-x thin films were synthesized using the DC magnetron sputtering method combined with thermal treatment. The corresponding tunability of local surface plasmon resonance characteristics and the enhancement of surface Raman scattering intensity were achieved due to the defects in the WO3-x thin films. With variations in the oxygen partial pressure during deposition combined with annealing temperature, the defect levels in the optical bandgap narrowed, and the crystalline quality of the WO3-x thin films deteriorated due to the increase in oxygen defect density. The synthesized WO3-x films demonstrated good uniformity and reproducibility in surface-enhanced Raman spectroscopy measurements, with a detection limit for R6G dye low as 10-7 mol/L and an enhancement factor of approximately 10-5.

POSTER PRESENTATION (Code: S3-07-P)

Error! Reference source not found. ***Optimization of Artificial Neural Network Model Applied to the Experimental Fabrication of Au Nanoparticles***

Cuong Hoang Luong (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)), Hao Nguyen Duc (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)), Lan Vu Duc (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)), Son Vo Hoa (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)) and Hieu Le Van (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)).

Abstract

This study aims to optimize an Artificial Neural Network (ANN) model to predict parameters in the fabrication process of gold nanoparticles (Au), enhancing the accuracy and efficiency of experimental procedures. By utilizing experimental data from gold nanoparticle fabrication processes, the research team developed and trained an ANN model with input parameters including temperature, reaction time, and concentrations of reactants. The structure of the ANN model was optimized by adjusting the number of hidden layers, the number of neurons per layer, and the activation functions. The results indicate that the optimized ANN model accurately predicts the parameters of the gold nanoparticle fabrication process, with accuracy evaluated by metrics such as Mean Squared Error (MSE) and the Coefficient of Determination (R^2). This ANN model can be widely applied in the research and development of nanomaterials, helping to minimize experimental costs and time while enhancing production efficiency. The application of artificial intelligence, particularly the ANN model, in gold nanoparticle fabrication research is a promising and effective direction in materials research. Key findings from the ANN survey include a hidden layer neuron count of 2, a learning rate of 0.05, a training function of traingda, and 800 epochs. With the optimized ANN model, it was possible to predict the uv-vis spectra of Au nanoparticles under varying fabrication conditions

PARALLEL SESSION

Session 4A. MEMS, Biosensors and Applications

- Chair and Co-chairs:
  - Assoc. Prof. Nguyen Van Toan (Tohoku Univ, Japan);
  - Prof. Congo Tak Ching (NCHU, Taiwan);
- Secretary: Nguyen Thi Tu Trinh-MSc (VNUHCM-University of Science, Vietnam)
  - *Opening session: 7:30; Coffee break:*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	Invited talk S4A-01-I Assoc. Prof. Dr. Naoki Inomata *(Tohoku University, Sendai, Japan)*	Microfabricated Thermometers: Focusing on Cellular Measurement Applications
	Invited talk S4A-02-I Dr. BK Lok (SEMI Southeast Asia)	Introduction to SEMI Technology Communtities
	Invited talk S4A-03-I Asst. Prof. Dr. Truong Thi Kim Tuoi *(Tohoku University, Sendai, Japan)*	Advanced Cooling and Heating Systems Utilizing Nanofluids
	Invited talk S4A-04-I Assoc. Prof. Dr. Nguyen Van Toan *(Tohoku University, Sendai, Japan)*	Nanoengineering Nanoporous Silicon Material for Thermal Energy Harvesting
	Oral S4A-01-O Trieu Le Ngoc, Sang Nguyen Thi Minh, Minh Truong Van, Khiem Le Hong and Son Nguyen An	Novel solution to improve the moss bag technique in environmental biological monitoring

Oral S4A-02-O Phuong Le Ngoc Nam, Tung Ho Quang, Linh Nguyen Khanh, Truc Do Thi Thanh, Duong Thai and Doanh Tieu Tu	Graphene nanoribbons coated on porous stainless steel as membrane for air purification and antibacterial ability with low voltage

Coffee break

Oral S4A-04-O Akane Kobayashi, Kenji Nakamura and Takahito Ono	Motor Status Measurement Using A Highly Sensitivity Magnetic Sensor
Oral S4A-05-O Anh Le, Danh Nguyen, Thanh Nguyen, Nguyen Tran, Giang Le and Trung Tran	Gas sensing properties of the MIL-100(Fe)/rGO composite
Oral S4A-06-O Thien-Luan Phan, Tun Yu Huang, Hsing-Ju Wu, Minh-Khue Ha, Ha Anh T. Nguyen, Ngoc Luan Tran, Anh-Hao Huynh-Vo, Nguyen Van Hieu and Congo Tak Shing Ching	Instant Identification of Glucose in Saliva Using Microelectrodes with Impedance Analysis

POSTER PRESENTATION: S4A.01-P, S4A.02-P.

INVITED TALK (Code: S4A-01-I)

Microfabricated Thermometers: Focusing on Cellular Measurement Applications

Naoki Inomata

Speaker: Assoc. Prof. Dr. Naoki Inomata

Tohoku University, Sendai, Japan
Email: inomata.n@tohoku.ac.jp

Abstract

Temperature is a crucial parameter affecting both the physical and mental states of animals, with cellular responses playing a fundamental role. Understanding cellular behavior in response to temperature variations is an area of significant interest. Optical methods using nanoparticles have generally been employed to measure intracellular temperatures. However, these methods often involve trade-offs between temperature and time resolutions. This presentation introduces the use of microfabricated thermometers for high-sensitivity, small-scale measurements, and fast response. Mechanical resonant thermometers, combined with a microfluidic device, enable precise heat detection in a vacuum, revealing periodic heat generation in non-stimulated cells. Additionally, micro-thermistors fabricated on glass substrates measure temperature changes in single cells, showing specific frequency components in temperature signals. Further experiments determine the thermal conductivity and specific heat of single cells under varying measurement conditions, highlighting ambient temperature and frequency-dependent thermal properties. This presentation demonstrates the potential of microfabricated thermometers to uncover unique thermal phenomena in cellular environments.

INVITED TALK (Code: S4A-02-I)

Introduction to SEMI Technology Communtities

Speaker: BK Lok
SEMI Southeast Asia
152 Beach Road, #09-03/04 Gateway East Singapore 189721 +65 6339.6361

www.semi.org

Abstract

This talk will introduce SEMI Technology Communtities especially focus in Smart MedTech Initiative which leverages MEMS and Sensor Industry Group (MSIG), FlexTech, Advanced Packaging and Nano-bio materials Consortium (nbmc), the enabling technologies in the development of biosensor applications and system in healthcare and MedTech. The speaker will share the technology trend in MEMS and Biosensors. In

MEMS, piezoelectric micromachined ultrasonic transducers (PMUTs) are emerging chip-based MEMS technology which is ideal for wearable and implantable medical devices, enabling real-time imaging, patient monitoring, and diagnostics. Their small size, high sensitivity, and compatibility with CMOS processes facilitate integration into a variety of devices, from catheter-based systems to handheld diagnostic tools. On the other hands, innovation in materials and flexible hybrid electronics enable unprecedented form-factor devices and applications in medical wearables and implantable such as wearable biophotonic microfluidic devices and water-responsive supercontractile bioelectronic interface electrode for inner organ monitoring.

INVITED TALK (Code: S4A-03-I)

Advanced Cooling and Heating Systems Utilizing Nanofluids

Truong Thi Kim Tuoi, Akira Yoko, Wahyudiono Wahyudiono, Ardiansyah Taufik, Suhendro Purbo Prakoso, Nguyen Van Toan, and Tadafumi Adschiri

Speaker: Asst. Prof. Dr. Truong Thi Kim Tuoi
Tohoku Univiversity, Sendai, Japan
Email: nguyen.tuoi.b6@tohoku.ac.jp

Abstract

High-performance cooling and heating systems are essential for various industrial and consumer applications. However, current methods often struggle with low efficiency, high energy consumption, and environmental impacts. This work introduces an innovative approach using nanofluids. Both theoretical and experimental studies have been conducted, utilizing nanoparticles such as TiO2 and CeO2. The properties of nanofluids, dependent on volumetric fractions, have been examined. Additionally, pipes with different diameters and lengths were investigated. Results show that the convective heat transfer coefficient can exceed 30,000 W/m²K for a pipe with a 0.5 mm diameter and 20 mm length.

INVITED TALK (Code: S4-04-I)

Nanoengineering Nanoporous Silicon Material for Thermal Energy Harvesting

Nguyen Van Toan, Yijie Li, Truong Thi Kim Tuoi, Masaya Toda, Nguyen Van Hieu, and Takahito Ono

Speaker: Assoc. Prof. Dr. Nguyen Van Toan
Tohoku University, Sendai, Japan

Abstract

Thermal energy harvesting is a sustainable technology for powering wireless sensing networks and electronic devices, especially in remote areas. This work explores nanoporous silicon materials, fabricated via metal-assisted chemical etching (MACE), for their unique properties enhancing efficiency. Nanoporous silicon's high surface area-to-volume ratio improves heat interaction and thermoelectric conversion. This work presents

the materials' properties, fabrication methods, and performance, showing a thermoelectric figure of merit (ZT) comparable to traditional materials. It introduces two novel approaches for thermoelectric generators: solid-state assembly technology and ionic liquid configurations. The findings highlight nanoporous silicon's potential as a scalable, green solution for thermal energy harvesting, advancing sustainable energy technologies.

ORAL PRESENTATION (Code: S4A-01-O)

Error! Reference source not found. ***Novel solution to impove the moss bag technique in environtment biological monitoring.***

Trieu Le Ngoc (Dalat University), Sang Nguyen Thi Minh (Dalat university), Minh Truong Van (Dong Nai University), Khiem Le Hong (Institute of Physics) and Son Nguyen An (Dalat University).

Abstract

Low doses of radiation can stimulate growth in plants in general and in mosses in particular and thereby enhance the ability of mosses to absorb airborne elements in the moss bag technique. The effect of low-energy X-ray radiation on the growth of Barbula indica moss was experimentally investigated with 20 doses of 1 to 20 Gy with a 1 Gy increment. The results showed that doses from 2 to 16 Gy improved the growth of moss compared to nonirradiated control samples and that the 14 Gy dose provided the optimal stimulation in terms of morphological characteristics, weight gain, and total chlorophyll content of the phyllids in the treated moss. The 14 Gy dose was chosen to irradiate moss that was exposed to the monitoring environment. The concentrations of the elements absorbed from the air were measured using the total reflection X-ray fluorescence (TXRF) technique for irradiated, nonirradiated, and native moss samples. The results showed that irradiated moss had a significantly higher ability to absorb elements from the air than nonirradiated moss, but the absorption was generally lower than for native moss. Our findings show that low-dose (14 Gy) radiation treatment of mosses is promising as an effective method to improve the accuracy of environmental monitoring by the moss bag technique.

ORAL PRESENTATION (Code: S4A-02-O)

Error! Reference source not found. ***Graphene nanoribbons coated on porous stainless steel as membrane for air purification and antibacterial ability with low voltage***

Phuong Le Ngoc Nam (Tran Dai Nghia High School for the Gifted), Tung Ho Quang (Tran Dai Nghia High School for the Gifted), Linh Nguyen Khanh (Research Laboratories of Saigon Hi-Tech Park), Truc Do Thi Thanh (Research Laboratories of Saigon Hi-Tech Park), Duong Thai (Research Laboratories of Saigon Hi-Tech Park) and Doanh Tieu Tu (Research Laboratories of Saigon Hi-Tech Park).

Abstract

Environmental pollution has recently become one of the most essential issues and has received critical attention in the world. Both fine dust particles (PM2.5, PM 1.0) and airborne bacteria penetrate the human body which causes diseases of the respiratory system and blood circulatory system. The innovative filter membranes which are both capable of filtering ultrafine dust and capable of destroying bacteria have been strongly studied. Graphene nanoribbons (GNRs) was synthesized from the multi-wall carbon nanotubes (CNTs) by the unzipping method. Then, various densities of graphene nanoribbon were coated on the porous stainless steel via the vacuum filtration process. The structure of graphene nanoribbons coating on the porous stainless steel was characterized by scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX). The filter membrane was evaluated at air resistance based on pressure drop-air flow and had the filtration efficiency of fine dust particles greater than 99%. The ability of destroying bacteria of this membrane was demonstrated with low voltage under 10V in a short time under 1 minute.The initial results indicated that the graphene nanoribbons coated on porous stainless steel has become the potential filter membrane because of commercial ability for large-scale production and applications in various fields such as air purifier, biomedical, food processing and water treatment.

ORAL PRESENTATION (Code: S4A-04-O)

Error! Reference source not found. *Motor Status Measurement Using A Highly Sensitivity Magnetic Sensor*

Akane Kobayashi (Tohoku university), Kenji Nakamura (Tohoku university) and Takahito Ono (Tohoku university).

Abstract

Motors play an important role not only in various fields of industry, but also in every household, including electric vehicles. In some applications it is necessary to control the rotation speed, and magnetic sensors are often used to detect and control it. In this case, the magnetic sensor is integrated inside the motor, and it detects the angle of the a rotating coil. On the other hand in repairing motors, although its quality was maintained through regular maintenance before, there were various problems such as downtime, spare parts, maintenance costs, and sudden breakdown. Then using current smart technologies, predictive maintenance is required to predict when failures will occur and take action before a critical failure occurs. Costs can be expected to be greatly reduced by eliminating routine maintenances and making repairs before the number of faulty parts increases. Currently, monitoring motors with current sensors built into many motors or easy-to-hand vibration sensors and acoustic sensors is widely studied. For example, successful classification of anomaly classes by convolutional neural network learning signals of a vibration sensor and an acoustic sensor, and initial detection of short-circuits in windings of a motor by data of a current sensor and vibration sensor have been reported. But for practical application, problems remain in terms of missing data to determine failure time, especially data before and after failure, and need for

installation. To predict failure with little data it is considered important to understand sensing data deeply and increase type of information, i.e., decision-making material. Therefore the objective of this research is to obtain information about the inside of induction motors from magnetic field data measured around an induction motor using a non-contact high-sensitivity magnetic sensor. The torque, current, and rotation speed of the motor is also measured at the same time, and those data including magnetic field are performed short-time Fourier transform on, and are compared to each other. As a result it is found that there are some peaks related to motor drive in the spectrum of the magnetic field data. An induction motor consists of a rotor and a stator. By applying alternating currents of different phases to the coils of the stator to create a pseudo rotating magnetic field, current flows to the rotor and the rotor is rotated by electromagnetic force. Current sensors measure only the current supplied to the stator, and vibration sensors and acoustic sensors measure vibration of the motor. In contrast, the magnetic sensor in this study was found to be able to measure the current flowing in the rotor and the rotation speed in addition to those information. More sophisticated analysis of these data is expected to bring failure prediction closer to practical application.

ORAL PRESENTATION (Code: S4A-05-O)

Error! Reference source not found. *Gas sensing properties of the MIL-100(Fe)/rGO composite*

Anh Le (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Danh Nguyen (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Thanh Nguyen (Laboratory of Advanced Materials, University of Science), Nguyen Tran (University of Information Technology), Giang Le (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science) and Trung Tran (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science).

Abstract

MIL-100(Fe) is a typical metal-organic framework (MOF) material, which is constructed of organic ligands benzene-1,3,5-tricarboxylate and metal clusters Fe-O. It has a porous structure and contains pores of different sizes enhancing the diffusion and absorption of gas into the MIL-100(Fe). However, one disadvantage of MOF in general and MIL-100(Fe) is poor electrical conductivity, making it hard to apply in gas sensors. To resolve that issue, there are many ways, one of which is to combine it with good electrical conductivity and stability materials like rGO, Ag, Cu, Au nanowires…. In this research, we are making a composite MIL-100(Fe)/rGO by using magnetic stirring at room temperature, in which the trimesic acid and ferrous chloride play role precursors, NaOH as a base catalyst and rGO (made by modified hummers method) as a dopant. In this composite, MIL-100(Fe) having high porous density acts as part of ammonia adsorbent based on Bronsted interaction between water molecules in MIL-100(Fe) structure and ammonia, as well as Lewis interaction of metal nodes with ammonia. rGO

has a layered carbon structure that results in excellent electrical conductivity making the composite low in resistance and increasing signal transfering ability.

ORAL PRESENTATION (Code: S4A-06-O)

Error! Reference source not found. *Instant Identification of Glucose in Saliva Using Microelectrodes with Impedance Analysis*

Thien-Luan Phan (Department of Physics and Electronic Engineering, University of Science, Vietnam National University - Ho Chi Minh City), Tun Yu Huang (Prospective Wound Medicine Research Center, Show Chwan Memorial Hospital, Changhua, Taiwan), Hsing-Ju Wu (Research Assistant Center, Show Chwan Memorial Hospital, Changhua City 500, Taiwan), Minh-Khue Ha (Department of Physics and Electronic Engineering, University of Science, Vietnam National University - Ho Chi Minh City), Ha Anh T. Nguyen (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Ngoc Luan Tran (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Congo Tak Shing Ching (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan) and Nguyen Van Hieu (Vietnam National University Ho Chi Minh City).

Abstract

Frequent monitoring of blood glucose is an indispensable aspect of diabetes management because maintaining blood glucose levels within the physiological range is crucial for effectively preventing diabetic complications. Consequently, there is a growing demand for economically, compact, portable, painless, and non-invasive blood glucose monitoring devices. According to previous research, the concentrations of glucose in both blood and saliva of diabetic patients significantly increase compared to the control group ($p < 0.05$). Our objective is to test the possibility of impedance to distinguish between samples with and without glucose, for future development. In this study, impedance analyzer and micro interdigitated electrode were employed to detect the glucose content in artificial saliva, aiming to distinguish different glucose concentrations in saliva. To assess interference factors, urea and uric acid were added to the artificial saliva, and interference experiments included urea alone, uric acid alone, combinations of urea with glucose, and combinations of uric acid with glucose. The analysis of experimental results determined characteristic frequencies related to uric acid and urea. Based on these results, a frequency represented as Z1199373.207 (log frequency = 6.07) was selected to generate a scatter plot. It was observed that glucose, urea with uric acid, urea combined with glucose, and uric acid combined with glucose formed three distinct regions. T-tests were conducted to assess differences observed among combinations, showing statistical significance when $p < 0.05$. This study demonstrates significant differences among glucose, urea with uric acid, urea combined with glucose, and uric acid combined with glucose, confirming the ability to distinguish glucose from urea and uric acid. These results validate the impedance analyzer and micro-forked electrodes for rapidly identifying differences in glucose and other components without the need for labeling or specialized techniques. Future applications as potential rapid sensors are conceivable, although further experimental validation is required.

POSTER PRESENTATION (Code: S4A-01-P)

Error! Reference source not found. ***Implementing biotreatment techniques to reduce pollution in open dumps.***

Lam Phung Thi Bich (Sub-department of Environment Protection, Department of natural resources and environment, Kien Giang) and Trung Tran Le Hoang (Dept. of Training - International Cooperation, Kien Giang College).

Abstract

In Vietnam, domestic waste weighs 60,000 metric tons daily, with municipal solid waste accounting for 60% of this total. Simultaneously, the accumulation of domestic waste is growing, with a significant portion of household garbage haphazardly piled up in open dumps. This not only consumes a significant amount of land resources, but also results in environmental contamination and the proliferation of mosquitoes, flies, and bacteria. Open dumps with a high organic fraction demonstrate the ease with which biotreatment can tackle environmental and sanitation issues. This paper will apply biotreatment by utilizing a combination of stabilized Bacillus strains and yeast species to treat volatile organic compounds, odors, and leachate, as well as achieving efficient physical transformations in the volume and size reduction of open dumps.

POSTER PRESENTATION (Code: S4A-02-P)

Error! Reference source not found. ***Investigating for Ammonia Gas Sensing performance of reduced Graphene Oxide - Metal-organic framework hybrid***

Nguyen Thanh Danh (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Huynh Van Giang (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Nguyen Thi Phuong Thanh (Laboratory of Advanced Materials, University of Science), Le Duc Anh (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Tran Quang Nguyen (Department of IC Design and Hardware, University of Information Technology), Tran Kim Chi (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science), Le Thuy Thanh Giang (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science) and Tran Quang Trung (Department of Solid State Physics, Faculty of Physics and Engineering Physics, University of Science).

Abstract

Graphene and its similar structures, especially reduced graphene oxide (rGO), have been proven as an ideal material for gas-sensing devices since their special properties of 2D materials such as: Large surface area, high carrier mobility… Strongly affect to the

ability to adsorb specific toxic gas molecules. However, the selectivity and repeatability of gas sensors based on pristine rGO are not relatively good, which has limited the performance in many practical gas sensing applications. To duel with the above limitations, in this study, we fabricated a composite structure between rGO and metal-organic framework materials (MOFs) by using solution technique. MOFs in general and MIL-100(Fe) material in particular have unique properties with a flexible structural framework that can change the size and shape of the pores and diversify the chemical functional groups inside the pores helps enhance the composite's ability to interact with gases, especially NH3. Meanwhile, rGO with highly electronic conductivity helps improve the signal reception ability of sensor devices.

PARALLEL SESSION

Session 4B. MEMS, Biosensors and Applications

- Chair and Co-chairs:

  . *Prof. Takahito Ono (Tohoku University, Japan);*

  . *Assoc. Prof. Nguyen Van Hieu (VNUHCM-University of Science Vietnam);*

- Secretary:
  - *Opening session: 7:30 ; Coffee break:*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	Invited talk S4B-01-I Nguyen Van Hieu *(BiSAE Lab, VNUHCM-University of Science)*	The DMF of Lab-On-A-Board for Biomedical Engineering studies
	Invited talk S4B-02-I Dr. Khairul Fadzli Samat *(Fakulti Teknologi dan Kejuruteraan Industri dan Pembuatan, Universiti Teknikal Malaysia Melaka, Malaysia)*	Impact of Graphene and Nanocellulose Incorporation on Bismuth Telluride Nanocomposite Film for Micro Thermoelectric Generator
	Invited talk S4B-03-I Dr. Sura Nguyen *(Tecnologico de Monterrey, Mexico)*	Synthesis and characterization of hierarchical suspended carbon fiber structures decorated with carbon nanotubes
	Oral S4B-01-O Ting-Yi Shen, Ngoc-Luan Tran	The Impact of Transcutaneous Vagus Nerve Stimulation on Depression in College Students
	Oral S4B-02-O Viet Huynh, Tuan Huynh	

Oral S4B-03-O Nhi N.T. Nguyen, Ho Thanh Huy, Thien Luan Phan, Nguyen ChiNhan, Nguyen Van Hieu, Congo Tak Shing Ching	A Multi-Input Convolutional Neural Network to RecognitionTask Based on Electroencephalogram Signals Noninvasive, Nondestructive In Ovo Chicken Egg GenderDetection Using Machine Learning Decision Tree Model
Oral S4B-04-O Hoa Bui	Control robot arm by EEG signal aided by artificialintelligence
Oral S4B-05-O Cuong Le, Tuan Huynh, Trang Doan, Thuan Nguyen	3D prior electrically resisitivity model building formagnetotelluric inversion using neural network algorithm tothe Kevitsa mineral deposit, Finland
Oral S4B-05-O Huy Tran Do, Viet Quoc Huynh, Tuan Van Huynh, Thinh XuanHuynh	Application of machine learning method and artificialneural network architectures in emotion classificationusing electroencephalogram

POSTER PRESENTATION: S4B.01-P, S4B.02-P

INVITED TALK (Code: S4B-01-I)

The DMF of Lab-On-A-Board for Biomedical Engineering studies

Luu Quy Ha, Hoang Nhat Son, Nguyen Phuoc Hoang Khang, Nguyen Hoang Phuc, Huynh Chan Khon, Tak Shing Ching Congo and Nguyen Van Hieu

Speaker: Assoc. Prof. Dr. Nguyen Van Hieu
BiSAE Lab, VNUHCM-University of Science

Email: nvhieu@hcmus.edu.vn

Abstract

Digital Microfluidics (DMF) is a technology for manipulating small volumes of liq-uids on the surface using electrical fields. DMF enables precise and flexible control of liquid droplets, making it a powerful tool in various research fields and industrial applications. In the application of Biology and Medicine, DMF is used in diagnostic tests, DNA/RNA analysis, and the development of compact medical devices. The DMF kits with micro controller was designed with 4x4 cells and fabricated in Bi-SAE laboratory (DPEE, VNUHCM- University of Science). A MAX1771 module was used to produce 200VDC high voltage with few mA. A total of 16 MOSFET can be open/close the application of voltage from the MAX1771 under the control of Arduino program. The droplet of liquid is moved on the cell's surface, coated with silicon oil, controlled by the program. The DMF kit, with an electrodes circuit specializes in measuring the impedance of liquid, can be used for DNA/RNA anal-ysis that are our works.

INVITED TALK (Code: S4B-02-I)

Synthesis and characterization of hierarchical suspended carbon fiber structures decorated with carbon nanotubes

Sura Nguyen [1], Claudia B. Flores [1], Marc J. Madou [1], Mallar Ray [1], Arnoldo Salazar [1], Regina Vargas [1], Iris Aguilar [1], Nancy E. Ornelas [1], Alejandro Torres-Castro [2], Sergio O. Martínez [1,*].

[1] *School of Engineering and Sciences, Tecnologico de Monterrey, Ave. Eugenio Garza Sada 2501, Monterrey 64849, Mexico*

[2] *Universidad Autónoma de Nuevo León, FIME-CIIDIT, San Nicolas de los Garza, 66600, Nuevo León, Mexico*

Speaker: Dr. Sura Nguyen
Tecnologico de Monterrey, Mexico
* C*orrespoding author: smart@tec.mx*

Abstract

Carbon nanotubes (CNTs) and carbon microfibers (CMFs) have emerged as promising materials for diverse applications due to their outstanding mechanical and electrical properties [1-3]. This study presents a novel method for integrating these two carbon materials into a unified architecture. By simultaneously conducting pyrolysis and chemical vapor deposition (CVD) using Fe-Co nanoparticle-embedded polyacrylonitrile (PAN) fibers as catalysts, we successfully achieved localized CVD of CNTs onto suspended CMFs [4]. The pyrolyzing PAN fiber acted as a carbon source for the CVD process, while the addition of camphor vapor further enhanced CNT growth and density. Characterization techniques, including SEM, TEM, XRD, Raman spectroscopy, and AFM, were employed to analyze the synthesized materials. Results demonstrated a significant reduction in electrical conductivity upon CNT incorporation, suggesting improved electrical properties and reduced defects. These findings highlight the potential of the fabricated structures in fields such as sensors, lithium-ion batteries, and microfabrication. Furthermore, the integrated pyrolysis-CVD approach offers economic benefits by reducing processing time, energy consumption, and chemical costs compared to traditional methods.

Keywords: CVD, pyrolysis, carbon nanotubes, suspended fiber.

References:

[1] Madou, M.J., V.H. Perez-Gonzalez, and B. Pramanick, Carbon: The Next Silicon?: Book 1-Fundamentals. 2016: Momentum Press.
[2] Holmberg, S., et al., Stress-activated pyrolytic carbon nanofibers for electrochemical platforms. Electrochimica Acta, 2018. 290: p. 639-648.
[3] Nguyen, S., et al., Characterizing Joule Heating Effects on Single Suspended Carbon Fibers: Calculating the Temperature Coefficient of Resistance for Localized Carbon Nanotube Growth. The Journal of Physical Chemistry C, 2024.
[4] Nguyen, S., et al., Synthesis and characterization of hierarchical suspended carbon fiber structures decorated with carbon nanotubes. Journal of Materials Science, 2024: p. 1-14.

INVITED TALK (Code: S4B-03-I)

Impact of Graphene and Nanocellulose Incorporation on Bismuth Telluride Nanocomposite Film for Micro Thermoelectric Generator

K.F. Samat[1,*], A.H.A. Rasyed[1], M.A. Alias[1], M.A.I.C. Azman1, N.V. Toan[2], T.Ono[2]

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[2]Department of Mechanical Systems Engineering, Tohoku University, Aoba-ku Sendai, 980-8579, Japan.

Speaker: Dr. Khairul Fadzli Samat
Fakulti Teknologi dan Kejuruteraan Industri dan Pembuatan,Universiti Teknikal Malaysia Melaka, Malaysia

Correspoding author: khairul.fadzli@utem.edu.my

Abstract

Thermoelectric is a compelling field of study due to its unique characteristic to generate electrical energy from the recovery of waste heat. Bismuth telluride (Bi_2Te_3), one of the thermoelectric (TE) materials with high performance in TE energy conversion at room temperature, still faces certain challenges in its electronic and micromechanical properties under film conditions. This work examines the effect of integrating graphene and nanocellulose with Bi_2Te_3 film on the enhancement of both thermoelectric and mechanical behaviours. The film fabrication process involves a 3-electrode setup of electrochemical deposition and the addition of different amounts of graphene and carbon nanofibers (CNFs) in electrolyte solutions. The electrolytes are prepared with enhanced suspension and dispersion of graphene CNFs. This leads in a more efficient deposition of dispersed graphene and CNFs in the nanocomposite film. This study successfully deposited up to 2.7 wt.% and 3.8 wt.% of graphene and CNFs, respectively, in the nanocomposite film, significantly reducing issues related to aggregated deposition. The electronic and mechanical properties of the Bi_2Te_3 have been greatly improved by adding both graphene and CNFs to it compared to the pure bismuth telluride film. The electrical conductivity increased by over 200%, up to 1956.18 S/cm, when compared to the pure bismuth telluride film. This increase is attributed to the impact of high electrical conductivity characteristic of the graphene. This work demonstrates a 100% increase in hardness and a 34% enhancement in Young's modulus compared to pure Bi_2Te_3 with the incorporation of CNF. The mechanical increase is attributed to the Hall-Petch effect, which limits plastic deformation, and is further augmented by the substantial reinforcing influence of carbon nanofibers (CNFs) in the Bi_2Te_3 matrix

ORAL PRESENTATION (Code: S4B-01-O)

Error! Reference source not found. ***The Impact of Transcutaneous Vagus Nerve Stimulation on Depression in College Students***

Congo Tak Shing Ching (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Thien-Luan Phan (Department of Physics and Electronics Engineering, University of Science, Vietnam National University HCM), Ting-Yi Shen (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Ngoc-Luan Tran (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Ha Anh T. Nguyen (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Peng-Ta Liu (Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung 402, Taiwan), Chih-Lung Lin (Department of Occupational Therapy, Asia University, Taiwan), Pei-Yi Chu (Department of Pathology, Show Chwan Memorial Hospital, Changhua City, Taiwan), Pai-Yi Chiu (Department of Neurology, Show Chwan Memorial Hospital, Chunghwa, Taiwan), Nguyen Van Hieu (Department of Physics and Electronics Engineering, University of Science, Vietnam National University HCM) and Tran Trung Nghia (Laboratory of Laser Technology, Ho Chi Minh City University of Technology (HCMUT), Ho Chi Minh City 72409, Vietnam).

Abstract

Background: Depression, a common issue among college students, significantly affects their academic performance and overall quality of life. Transcutaneous vagus nerve stimulation (tVNS) through auricular points emerges as a potential solution for mitigating depressive symptoms.

Methods and Materials: This study involved nine college students (4 males, 5 females). Each participant was subjected to two tVNS stimulation protocols: Mode A (monophasic mode) and Mode B (biphasic mode). These modes were randomly assigned with a one-week interval. Each mode's electrical stimulation was administered for 15 minutes daily over a span of five days. Heart rate variability (HRV) parameters, including SDNN, SD1, SD2, NN50, and PNN50, were recorded. The outcomes were analyzed using Generalized Estimated Equation (GEE) models, including factors stimulation mode and treatment periods.

Results: No significant differences were observed in the main effects of stimulation type and treatment periods. However, notable changes were detected in HRV parameters (SDNN, SD2, NN50, and PNN50) between the first and second day. Mode A demonstrated higher HRV values compared to Mode B after tVNS stimulation. Conclusion: The findings suggest that tVNS potentially influences HRV, indicating an indirect mechanism for depression improvement. To validate these initial findings, further research involving more frequent and extended stimulation sessions is recommended

ORAL PRESENTATION (Code: S4B-02-O)

Error! Reference source not found. ***A Multi-Input Convolutional Neural Network to Recognition Task Based on Electroencephalogram Signals***

Viet Huynh (VNU-HCMUS) and Tuan Huynh (VNU-HCMUS).

Abstract

Researchers have demonstrated that Electroencephalography is crucial for identifying brain activity patterns associated with different mental states and cognitive processes, facilitating the development of automatic task detection methods to enhance problem-solving efficiency. Traditional EEG feature extraction is often time-consuming and requires specialized knowledge. To overcome this, a study proposes a multi-input deep convolutional neural network that integrates a 3D-CNN and an artificial neural network to analyze EEG topographical heat maps and 640 statistical features of EEG signals. This approach incorporates score fusion at the Softmax layer to boost model accuracy. Experiments Schizophrenia dataset reveal that this multi-view feature-based method surpasses single-view methods in classification accuracy and exhibits superior performance and sensitivity compared to other seizure detection techniques. Consequently, this automatic seizure detection method can significantly reduce diagnosis time and provide experts with precise, reliable assistance.

ORAL PRESENTATION (Code: S4-02-O)

Error! Reference source not found. *Noninvasive, Nondestructive In Ovo Chicken Egg Gender Detection Using Machine Learning Decision Tree Model*

Nhi N.T. Nguyen (Department of Physics and Electronics Engineering, University of Science, Vietnam National University HCM), Ho Thanh Huy (Department of Physics and Electronic Engineering, University of Science, Vietnam National University - Ho Chi Minh City), Thien Luan Phan (Graduate Institute of Biomedical Engineering, National Chung Hsing University), Nguyen Chi Nhan (Department of Physics and Electronic Engineering, University of Science, Vietnam National University - Ho Chi Minh City), Nguyen Van Hieu (Department of Physics and Electronic Engineering, University of Science, Vietnam National University - Ho Chi Minh City) and Congo Tak Shing Ching (Graduate Institute of Biomedical Engineering, National Chung Hsing University).

Abstract

The impedance analysis method, widely employed in human biology, is now garnering attention in biomedical research for a novel application—analyzing impedance signals during the egg incubation process to predict the gender of chickens within the eggs. In the contemporary landscape, Artificial Intelligence (AI) and Machine Learning play pivotal roles in livestock farming, offering cost-effective and labor-efficient solutions. 35 Taiwanese chicken eggs—20 male and 15 female—were used in this research. During the eggs were incubated, the impedance values of the four electrodes—Z1, Z2, Z3, and Z4—were recorded. Use current between 100kHz and 8MHz in frequency. The findings indicate that the impedance ratio between the two pairs of electrodes Z2 and Z3 compared to Z2 and Z4 on the eleventh day of incubation, while examining the frequency range of 1MHz to 2MHz, reveals the difference between males and females.

Train the data set as an impedance ratio using the Decision Tree approach in conjunction with k-folds. The findings demonstrate that the model's accuracy in determining chicken egg gender based on their impedance ratio is 80.67%.

ORAL PRESENTATION (Code: S4-03-O)

Error! Reference source not found. *Control robot arm by eeg signal aided by artificial intelligence*

Hoa Bui (VNUHCM-University of Science, Vietnam) and Tuan Huynh (VNUHCM-University of Science, Vietnam).

Abstract

The Emotiv EPOC has been used in a variety of applications, due to its accessibility for consumers and researchers. The EEG signals will in turn be classified into thinking labels such as: left, right, ...through algorithms from machine learning. This study aims to apply the EEG signal obtained from the 5-channel Emotive EPOC device to control the robotic arm. The support vector machine (SVM) algorithm is used to classify EEG data because of its high accuracy. The results of the classification are converted into commands through Matlab and Arduino software. The robotic arm system connected to the computer is used to move to a desired position from user.

ORAL PRESENTATION (Code: S4-04-O)

Error! Reference source not found. *3D prior electrically resisitivity model building for magnetotelluric inversion using neural network algorithm to the Kevitsa mineral deposit, Finland*

Cuong Le (University of Science, Ho Chi Minh City, Vietnam; Vietnam National University, Ho Chi Minh City, Vietnam), Tuan Huynh (University of Science, Ho Chi Minh City, Vietnam; Vietnam National University, Ho Chi Minh City, Vietnam), Trang Doan (University of Science, Ho Chi Minh City, Vietnam; Vietnam National University, Ho Chi Minh City, Vietnam) and Thuan Nguyen (University of Science, Ho Chi Minh City, Vietnam; Vietnam National University, Ho Chi Minh City, Vietnam).

Abstract

Geology information can be interpreted from data collected from drill holes and geophysical method surveys. Limited number of expensive drill holes cannot provide enough information for the vast interest area, but geophysical methods can tell the soil properties through physical parameters as resistivity and seismic velocity if their measurement stations can be sufficiently located. Useful prior geophysical parameter models play a vital role in directing their inversion flow and recovering the good predicted earth model. Geophysical parameters and chemical elements have strong correlations. This inspires 3D electrically resistivity model building from existences of data collected from drill holes in the Kevitsa Ni-Cu-PGE mineral deposit, Northern

Finland. In our work, shallow neural network is applied to predict resistivity value from available mineral chemical elements for each drill holes. Then, 3D interpolation can build 3D resistivity model from all the resistivity values as being original or predicted. The processed model can show great match with seismic data and other drill hole information.

ORAL PRESENTATION (Code: S4-05-O)

Error! Reference source not found. ***Application of machine learning method and artificial neural network architectures in emotion classification using electroencephalogram***

Huy Tran Do (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM), Viet Quoc Huynh (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM), Tuan Van Huynh (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM) and Thinh Xuan Huynh (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM).

Abstract

Human emotion plays an important role in communication without using language. EEG-based emotion recognition has been having many practical applications such as affective computing, modeling human-computer interaction, and monitoring mental health. However, the computation process faces many difficulties such as processing and extracting features, optimizing classification algorithms. In this research, we aim to identify two emotional states, arousal and valence, using machine learning algorithms. The emotional signal dataset is taken from the DEAP database for the research process. The research will focus on accuracy and training time. The results obtained using the lasso regression model to extract the most important components from common features show improvement in emotion classification. In addition to machine learning methods, the research builds an artificial neural network model to enhance the results of bi-emotional state recognition. Our research is also compared with the studies of other authors studies to prove the effectiveness of the classification algorithm.

POSTER PRESENTATION (Code: S4B-01-P)

Error! Reference source not found. ***Exact modeshape and frequency of torsional vibration of overhang-shaped cantilevers***

Le Tri Dat (Dong Nai Technical University) and Nguyen Duy Vy (Van Lang University).

Abstract

The torsional mode of the atomic force microscope (AFM) cantilevers has been widely used in various measurements where the high sensitivity of the AFM. The approximated frequency and mode shape of the overhang-shaped cantilevers are usually used and give rises to several inconsistency between the calculated values and the experimental

results. In this talk, we present the calculation of the frequency and mode shape of the width-varying cantilevers so that the frequency and modeshape of any higher-order mode could be obtained. This gives fruitful method for the experimentalist to choose the suitable geometric parameters for the cantilever targeting a specific frequency.

POSTER PRESENTATION (Code: S4B-01-P)

Error! Reference source not found. ***Optimization of Artificial Neural Network Model Applied to the Experimental Fabrication of Au Nanoparticles***

Cuong Hoang Luong (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)), Hao Nguyen Duc (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)), Lan Vu Duc (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)), Son Vo Hoa (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)) and Hieu Le Van (University of Science, Vietnam National University Ho Chi Minh City (VNU-HCM)).

Abstract

his study aims to optimize an Artificial Neural Network (ANN) model to predict parameters in the fabrication process of gold nanoparticles (Au), enhancing the accuracy and efficiency of experimental procedures. By utilizing experimental data from gold nanoparticle fabrication processes, the research team developed and trained an ANN model with input parameters including temperature, reaction time, and concentrations of reactants. The structure of the ANN model was optimized by adjusting the number of hidden layers, the number of neurons per layer, and the activation functions. The results indicate that the optimized ANN model accurately predicts the parameters of the gold nanoparticle fabrication process, with accuracy evaluated by metrics such as Mean Squared Error (MSE) and the Coefficient of Determination (R^2). This ANN model can be widely applied in the research and development of nanomaterials, helping to minimize experimental costs and time while enhancing production efficiency. The application of artificial intelligence, particularly the ANN model, in gold nanoparticle fabrication research is a promising and effective direction in materials research. Key findings from the ANN survey include a hidden layer neuron count of 2, a learning rate of 0.05, a training function of traingda, and 800 epochs. With the optimized ANN model, it was possible to predict the uv-vis spectra of Au nanoparticles under varying fabrication conditions

Session 5. Microelectronics, Embedded System and AI&IoT

- Chair and Co-chair: .
  - **Dr. Nguyen Chi Nhan** (VNUHCM-US, Vietnam) .
  - **Dr. Luong Phuoc Toan** (MTU, Vietnam)
- Secretary: **Vo Hoang Thuy Tien-MSc** (VNUHCM-US, Vietnam) .
- Room: **201**, Science Research Building - Campus B, Mien Tay Construction University
  - *Opening session: 7:30 ; Coffee break:*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	INVITED TALK S5.01-I **Ms. Tateshiro Asura** *(Ito Group, Nippon Avionic, Japan)*	Hermetic Sealing Technology for Electronic Components by Brazing Method
	INVITED TALK S5.02-I Dr. Tran Thien Huan *(Saigon University, Vietnam)*	Stable Gait Optimization For Legged Robots
	INVITED TALK S5.03-I **Dr. Tran Dinh Cuong** *(Ton Duc Thang University, Vietnam)*	Compensation Based on CB MRAS Technique for Induction Motor Drives
	INVITED TALK S5.04-I Dr. **Nguyen Chi Nhan** *(VNUHCM-University of Science, Vietnam)*	A slot scheduling technique application in improving battery life cycle in IoT nodes
	ORAL PRESENTATION S5.01-O Assoc. Prof. Dr. **Vo Ngoc Dieu** (VNUHCM-University of Technology, Vietnam)	An Improved Chaotic-Symbiotic Organisms Search Algorithm for Optimal Scheduling of Electric Vehicle Charging and Discharging in Distribution Systems with Integrated Distributed Generations
	ORAL PRESENTATION S5.02-O Ph.D **Vo Hong Hai**	Development of -Based coincidence electronic using NI MyRIO Hardware for Gama-Gamma angular correlation system.

	(VNUHCM-University of Science, Vietnam)	
	ORAL PRESENTATION S5.03-O **Nguyen Thi Nhu Quynh** (VNUHCM-University of Science, Vietnam)	Parkinson's Disease diagnosis by using EEG signals with IClabel and Advanced Ensemble method
	ORAL PRESENTATION S5.04-O **Vo Hoang Thuy Tien** (VNUHCM-University of Science, Vietnam)	Recognition of basic human tastes using EEG signals
	ORAL PRESENTATION S5.05-O **Tran Hoang Nhut** (University of Science, Vietnam National University Ho Chi Minh City)	An AIoT-Based system for efficient classification
	ORAL PRESENTATION S5.06-O **Tung Than The** (University of Information Technology)	REAL-TIME OBJECT TRACKING FOR ELDERLY-CARE ROBOT: ADAPTIVEOCCLUSION HANDLING AND MODEL UPDATING
	ORAL PRESENTATION S5.07-O **Phan Nguyet Thuan** (Faculty of Physics and Engineering Physics, University of Science, Ho Chi Minh City, Vietnam)	Classification of Finger Movement Using EMG Sensor Signal
	ORAL PRESENTATION S5.08-O **Duy Dieu Nguyen** (VNUHCM-University of Information Technology, Vietnam)	**Recognize license plates with smart cameras using SoC technology** Signal
7:15:00 AM-10:30:00 AM	**POSTER PRESENTATION** S5.01-P Mr. **Vo Minh Thien** (University of Technology, VNUHCM)	Coronavirus Herd Immunity Optimizer for Optimal Placement of Electric Vehicle Charging Stations in Distribution Networks with Integrated Distributed Generations
7:15:00 AM-10:30:00 AM	**POSTER PRESENTATION** S5.02-P MSc, Ph.D Student **Nguyen Phuoc Hoang Khang** (VNUHCM-University of Science, Vietnam)	Applying Mask-RCNN machine learning model for hot-spot detection in thermal images of photovoltaic panel
7:15:00 AM-10:30:00 AM	**POSTER PRESENTATION** S5.03-P **Toan Luong**	Intergrating gas sensor to be automatically opened the rolling

	(MIEN TAY CONSTRUCTION UNIVERSITY)	dooe on the ESP8266 Microcontroller
7:15:00 AM-10:30:00 AM	**POSTER PRESENTATION** S5.04-P **Phong Nguyen Duyen** (Hanoi University of Mining and Geology)	Research warns of environmental pollution in high-rise building basements today using IoT technology

INVITED TALK (S5.01-I)

Hermetic Sealing Technology for Electronic Components by Brazing Method

Tatsuya Oguchi, Asuka Tateshiro, Satoshi Sakaba*

Ito Group, Nippon Avionic, Japan

Abstract

Parallel seam sealing is a method to hermetically seal lids to packages containing electronic components. Using the principle of resistance welding, brazing materials such as nickel and gold-tin are melted and sealed through resistance heating. Compared to other joining methods, parallel seam sealing has reduced thermal effect on the internal elements and higher joining strength.

Electronic components with hollow structures, such as quartz devices, acceleration sensors, and optical communication devices, require airtight sealing for maintaining their characteristics. Additionally, shielding from the external atmosphere ensures long-term reliability. The presentation content covers the principles of airtight sealing technology, mainly seam sealing, and its application examples, along with an overview of the equipment used.

Nippon Avionics' Parallel Seam Sealers are the industry leaders for sealing crystal oscillators. The product line ranges from fully automated machines for use in mass production, to small-lot production and R&D applications.

Keywords: hermetic seal, seam sealing, optical device, crystal device, saw device, sensor, HIC, automotive, medical.

INVITED TALK (S5.02-I)

Stable Gait Optimization For Legged Robots

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[3] Faculty of Electronics and Telecommunication (FET), Saigon University (SGU), 273 An Duong Vuong Street, District 5, Ho Chi Minh City, Vietnam
[1] Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Viet Nam;
[2] Vietnam National University Ho Chi Minh City (VNU-HCM), Linh Trung Ward, Thu Duc District, Ho Chi Minh City, Viet Nam
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Abstract

We propose a Walking Pattern Generator (WPG) that depends on four parameters (step length - S, leg lift - H, knee bend - h, and hip sway - n) combined with the MOJaya optimization algorithm to make the robot dog walk stably at the fastest possible speed. The details are as follows:

• The trajectories of the hips and feet at each leg of the robot dog depend on four gait parameters (S, H, h, and n) which will be established based on the dog's movement law and the third-order interpolation function.

• 12 joint angle trajectories at the four legs of the robot dog will be derived from the interpolated trajectories of the hips and the trajectories of the feet at the four legs of the robot dog by solving the inverse kinematics problem using the analytical method.

• Establish two objectives of speed and stability, by relying on the gait characteristics (gait parameters, CoP/ZMP trajectories) of the robot dog from 12 joint angle trajectories at the four legs of the robot dog by solving the forward kinematics problem using the analytical method.

• Apply the MOJaya algorithm to find the four optimal gait parameters, so that the robot dog can walk steadily at the highest possible speed.

This proposal applies to B3-BOT. The simulation results demonstrate that B3-BOT walks steadily at the highest possible speed.

Keywords: ZMP – Zero Moment Point, WPG – Walking Pattern Generator, Legged robotics, Pareto optimal front, MO JAYA optimization algorithm

INVITED TALK (S5.03-I)

AN ENHANCED SCALAR CONTROL METHOD APPLYING SLIP COMPENSATION BASED ON CB MRAS TECHNIQUE FOR INDUCTION MOTOR DRIVES

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Abstract

The speed control for the induction motor applying the scalar control technique is the research object of this paper. The typical scalar control technique is commonly used in medium-performance industrial applications. The characteristic of the typical scalar control technique is keeping the voltage/ frequency ratio fixed (V/f = constant) in the control process. The disadvantage of the scalar control technique is that the operating motor speed should be lower than the setting speed corresponding to the operating slip. This research proposes using the virtual speed to compensate for slip losses during the motor speed control process. The current-based model reference adaptive system (CB-MRAS), according to high precision, is applied to create the virtual speed for the compensation algorithm. The slip compensation value is updated in each setting period to ensure the control performance even under the changing load during operation. The effectiveness of this control method is verified through simulation results by comparing the typical technique and the proposed method under various operating conditions in MATLAB/Simulink environment

Keywords: Scalar control, speed control, rotor slip, current sensors

INVITED TALK (S5.04-I)

A SLOT SCHEDULING TECHNIQUE APPLICATION IN IMPROVING BATTERY LIFE CYCLE IN IoT NODES

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Abstract

An IoT node is one of the key technological components of the Internet of Things (IoT). Increasing the lifetime of IoT nodes is a challenging problem under energy-constrained conditions. As IoT applications expand into various environments, the demand of life-long expectancy IoT node is required for effective performance. In practical applications, IoT nodes are usually placed at remote locations where power utility hardly found and must used battery to provide power. However, this limits the performance of an IoT node because of the possibility of communication disruption and maintenance costs when the battery is depleted. Therefore, low-power IoT nodes could increase the lifetime of a battery without an external power source. In this study, a slot scheduling technique is used to improve the low power consumption of the IoT node. This technique splits the operation period of the duty cycle into slots, potentially reducing the issue of idle listening. The slot scheduling method assists in identifying the node that utilizes the operation period most efficiently.

Keywords: *Internet of Things, low-power IoT node, energy-saving techniques, slot scheduling technique*

ORAL PRESENTATION (S5.01-O)

AN IMPROVED CHAOTIC-SYMBIOTIC ORGANISMS SEARCH ALGORITHM FOR OPTIMAL SCHEDULING OF ELECTRIC VEHICLE CHARGING AND DISCHARGING IN DISTRIBUTION SYSTEMS WITH INTEGRATED DISTRIBUTED GENERATIONS

Thien Vo Minh, Tien Doan Kieu Thi, Hoang Diep Chan, Khai Mai Phu and Dieu Vo Ngoc

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Abstract

The rapid increase of Electric Vehicle Charging Stations (EVCS) has caused various impacts and complex constraints on the distribution network. Ensuring stability, safety, operational efficiency, along with load development and maximizing the use of renewable energy sources, it is always a concern for investors. In this study, we propose an optimal scheduling model for charging and discharging (V2G) of EVCS, applying V2G technology in a distribution network integrated with the mobilization of distributed generation (DG) capacity, aiming to minimize power loss costs and stabilize node voltage. An improvement combining chaotic functions with the original Symbiotic Organisms Search (CSOS) algorithm is applied to solve the problem. The IEEE 33 and 69 buses distribution networks have been used for testing, and solutions are sought through simulation in Matlab software with optimal scheduling scenarios during peak, off-peak, and normal hours within a day as regulated in Vietnam. The results are compared and evaluated to assess the effectiveness of the CSOS algorithm in the optimal scheduling model for EVCS applying V2G

Keywords: *EVCS, Charging Scheduling, Symbiotic Organisms Search, V2G, Electric Vehicle.*

ORAL PRESENTATION (S5.02-O)

DEVELOPMENT OF FPGA-BASED COINCIDENCE ELECTRONIC USING NI MYRIO HARDWARE FOR GAMA-GAMMA ANGULAR CORRELATION SYSTEM.

Vo Hong Hai, Toan Phuc Nguyen Tri and Nguyen Trong Tin

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Abstract

This study introduces the development and application of a field programmable gate array (FPGA)-based coincidence electronic system utilizing compact NI MyRIO hardware for gamma-gamma angular correlation measurements. We develop FPGA-based coincidence electronics with NI MyRIO hardware from National Instruments Corp., integrating LabVIEW embedded codes for FPGA and real-time (RT) virtual instrument (VI) functionalities. These functionalities encompass timing, coincidence detection, counting, and automated rotation operations. The system's performance is evaluated using a pulse generator and subsequently applied in a gamma–gamma angular correlation experiment. The system demonstrates a highly linear response, capable of exceeding 5 MHz, making it suitable for gamma–gamma coincidence experiments with moderate counting rates. Employing a Na-22 source with an approximate activity of 0.2 μCi and two CsI(Tl) scintillation detectors, we measured the angular correlation of gamma emissions from the positron/electron annihilation of Na-22. Our findings reveal a distinct annihilation peak, observed in the back-to-back emission measured at 180°. The geometric arrangement between the Na-22 source and the CsI(Tl) detectors allows us to determine the sigma of the annihilation peak to be about 4°, highlighting the effectiveness of the FPGA-based system in facilitating advanced research in nuclear physics by providing enhanced precision and reliability in angular correlation measurements.

Keywords: *FPGA, Coincidence technique, Gmma–gamma angular, correlation, scintillation detector, Annihilation peak*

ORAL PRESENTATION (S5.03-O)

PARKINSON'S DISEASE DIAGNOSIS BY USING EEG SIGNALS WITH ICLABEL AND ADVANCED ENSEMBLE METHOD

Thi-Nhu-Quynh Nguyen, Hoang-Thuy-Tien Vo and Tuan Van Huynh

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Abstract

Parkinson's Disease (PD) is a prevalent neurodegenerative disorder affecting over 10 million individuals globally, with no current cure. Early and accurate diagnosis is pivotal for managing PD effectively. This study investigates the utility of electroen-cephalography (EEG) in PD diagnosis, utilizing a public dataset featuring EEG re-cordings from 28 PD patients and 28 age-matched healthy controls. The EEG sig-nals underwent Independent Component Analysis (ICA) to extract multiple compo-nents, subsequently processed using ICLabel to discern and eliminate artifacts. Among various denoising techniques, FastICA demonstrated superior performance. Clean EEG signals were then subjected to feature extraction, incorporating various types of features. In the classification stage, an advanced ensemble method XGBoost was employed, leveraging the denoised EEG data. The findings showcase state-of-the-art performance in PD diagnosis. By integrating EEG analysis with conventional clinical assessments, the study underscores the potential of EEG as a complementary tool for enhancing the accuracy of PD diagnosis. This research contributes to ad-vancing diagnostic methodologies for PD, emphasizing the promise of EEG in facili-tating early detection and improving patient outcomes.

Keywords: *Parkinson's Disease, EEG signal, ICA, Iclabel, XGBoost,*

ORAL PRESENTATION (S5.04-O)

RECOGNITION OF BASIC HUMAN TASTES USING EEG SIGNALS

Hoang-Thuy-Tien Vo, Thi-Nhu-Quynh Nguyen and Tuan Van Huynh

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Abstract

Identifying the basic human tastes through EEG signals is based on the scientific idea of using electroencephalography (EEG) signals to decode and analyze the brain's responses when a person perceives different taste types such as sweet, sour, salty, and bitter. EEG signals, reflecting the brain's electrical activity, can provide valuable data on how the brain processes information related to taste sensations. The urgency of this paper is demonstrated through three main application areas. In the medical field: Understanding the relationship between taste sensation and brain signals can aid in diagnosing and treating taste-related disorders, especially in cases of taste loss due to aging, injury, or diseases such as COVID-19, Parkinson's, and Alzheimer's. In the industrial field, such as the food and beverage industry, product development can be improved by analyzing detailed consumer taste responses, thereby optimizing products to match their preferences. In scientific research, decoding brain signals related to taste sensation provides crucial information for neuroscience research, enhancing our understanding of how the brain processes information. The novelty of the paper is reflected in its interdisciplinary approach. It combines knowledge and methods from various fields, including neuroscience, biotechnology, and machine learning, offering a new approach to decoding brain activities. Technological development includes using deep learning techniques and artificial intelligence to decode complex patterns of EEG signals, opening up possibilities for practical applications such as automatic and personalized taste perception measurement devices.

Keywords: *Classification, Taste, EEG*

ORAL PRESENTATION (S5.05-O)

AN AIOT-BASED SYSTEM FOR EFFICIENT CLASSIFICATION

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Abstract

Rice diseases have significant negative effects on the quality and quantity of rice production. The accurate and fast diagnosis of rice diseases is the key to avoiding these negative effects. Recent remarkable advancements in the fields of Internet of Things (IoT) and artificial intelligence (AI) have given rise to a novel concept known as Artificial Intelligence of Things (AIoT). In this paper, an AIoT-based system has been designed for efficient classification of rice leaf diseases. Machine learning models have been built based on deep convolutional neural networks such as YOLO and ResNet and evaluate the capability of distinguishing healthy cases with three types of rice leaf diseases include leaf blast, hispa and brown spot. Each machine learning model provides quite good classification results; however, there are still some confusion cases between types of diseases. To increase accuracy in classifying rice leaf diseases, we use a machine learning technique called ensemble learning, specifically stacking and averaging-based ensemble methods. The most optimal machine learning model was used to deploy on IoT platforms, including server and web-application.

Keywords: *classification of rice leaf diseases, machine learning, deep learning, artificial intelligence of things (AIoT)*

ORAL PRESENTATION (S5.06-O)
REAL-TIME OBJECT TRACKING FOR ELDERLY-CARE ROBOT: ADAPTIVEOCCLUSION HANDLING AND MODEL UPDATING

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Abstract

Object tracking is a critical field in computer vision with extensive applications, particularly in robotics. Despite its importance, Visual Object Tracking (VOT) encounters significant challenges such as distortion, brightness variations, motion blur, deformation, occlusion, illumination variation, and motion blur and notably, occlusion. Moreover, integrating VOT algorithms into embedded robotic systems presents difficulties due to limited computational resources and real-time processing requirements. We propose a robust, stable, and integrable method tailored for resource-constrained embedded systems by combining two efficient tracking algorithms: the Kernelized Correlation Filter (KCF) and the Kalman Filter (KF). Specifically, our method employs the Average Peak-to-Correlation Energy (APCE) reliability index of the response map between consecutive frames to detect occlusions, adjust the learning rate of the model, and effectively address occlusions. Experimental results demonstrate that our proposed method significantly enhances performance on the OTB-100 and LaSOT benchmarks compared to several correlation-based, feature-based, and deep learning-based trackers. For the occlusion challenge, our tracker achieves an overlapping success rate of 0.602 on OTB-100 and 0.241 on LaSOT, while maintaining a processing speed of up to 30 FPS on the Jetson Nano.

Keywords: *Real-time object tracking, Adaptive occlusion judgment, Model updating, Re-detection, Kernel correlation filter, Kalman filter, Elderly-Care robot*

ORAL PRESENTATION (S5.07-O)

CLASSIFICATION OF FINGER MOVEMENT USING EMG SENSOR SIGNAL

Thuan Nguyet Phan, Thuy-Le Nguyen-Thi, Tuan Van Huynh

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Abstract

Electromyogram (EMG) signals are important bioelectric signals with significant diagnostic value for various muscle and nerve diseases. These signals are generated from physiological changes during muscle contraction or relaxation. The aim of this study is to investigate hand movement classification using surface electromyography (sEMG) signals. We utilized two sets of self-acquired data from two types of muscle sensors: the Muscle BioAmp Patchy from UpSideDown Labs, and the Analog EMG sensor - a collaboration between DFRobot and OYMotion. By employing the windowing technique, we segmented the EMG data and extracted temporal features from these segments. Subsequently, we trained an Artificial Neural Network model for basic pattern recognition using the extracted feature data.

Keywords: *electromyogram signals, sensor, ANN, time features, time window, classification.*

ORAL PRESENTATION (S5.08-O)

RECOGNIZE LICENSE PLATES WITH SMART CAMERAS USING SOC TECHNOLOGY

Duy Dieu Nguyen, Manh Hung Le and Minh Son Nguyen

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Abstract

In recent years, there have been significant advances in microchip development, allowing the integration of complex systems onto a single chip. Smart Cameras are one particular application, whose recognition capabilities have attracted considerable interest from research groups at universities and companies. The design of these systems requires a focus on speed, accuracy, energy consumption, and product cost. This article focuses on research to build and deploy machine learning algorithms on a Smart camera system using Xilinx's IP Deep Learning Process Unit (DPU) on Board Ultra96-V2 with SoC ZU3EG to recognize license plates. The system tested with a resolution of 1024x800 pixels had a license plate recognition time and reached a speed of 5 frames per second, with an average accuracy of 95.73% within a testing distance of 5m. The system has undergone performance evaluation regarding uptime, recognition distance, and different frame sizes to demonstrate that it can be widely adopted.

Keywords: *SoC, AI&IoT, Recognize license plates, Smart Camera*

POSTER PRESENTATION (S5.01-P)

CORONAVIRUS HERD IMMUNITY OPTIMIZER FOR OPTIMAL PLACEMENT OF ELECTRIC VEHICLE CHARGING STATIONS IN DISTRIBUTION NETWORKS WITH INTEGRATED DISTRIBUTED GENERATIONS

Thien Vo Minh, Tien Doan Kieu Thi, Hoang Diep Chan, Hau Nguyen Van and Dieu Vo Ngoc

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Abstract

Planning and developing infrastructure for electric vehicle charging stations (EVCS) is necessary to serve the rapidly increasing number of electric vehicles (EVs) today. On the other hand, issues of stable operation, solving complex constraints, optimizing renewable energy sources, and economic efficiency of EVCS investment in the distribution network are of interest. In this study, we propose a model to determine the optimal location and size of EVCS in the distribution network with integrated distributed generation (DG) in two objective functions, the first is to minimize power loss, the second is to minimize the cost of power loss and the cost of installing EVCS in the distribution network. The Coronavirus herd immunity optimization (CHIO) method is applied to solve the problem, the IEEE 34 bus distribution network is used for testing and is simulated and searched using Matlab software. The results of the problem are compared with published models, demonstrating the effectiveness of the CHIO algorithm, as well as the EVCS location and size optimization problem model.

Keywords: *EV charging station, land cost index, CHIO optimal algorithm EV, population, optimal placement*

POSTER PRESENTATION (S5.02-P)

APPLYING MASK-RCNN MACHINE LEARNING MODEL FOR HOT-SPOT DETECTION IN THERMAL IMAGES OF PHOTOVOLTAIC PANEL

Phuoc Hoang Khang Nguyen, Minh Triet Nguyen, Chi Nhan Nguyen and Van Tuan Huynh

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Abstract

In recent years, the remarkable development of the solar power industry has been undeniable. This led to the necessity in monitoring and maintenance of solar power plants due to many issues and failures that affect the efficiency and lifespan of the system. One of the most common fault cases of solar system is the hot spot in photovoltaic panels created by the mismatch of cells in the panel due to incompatible environmental condition or physical damages causing the heat up of low power cells. The hot spot is detected through thermal image capture by thermal camera and analysis through image processing technique with manual adjustment and testing. With recent significant achievements and growth of machine learning methods in image processing and technical diagnosis, it is greatly possible to develop a machine learning model to perform hot spot detection for higher efficiency and automation. In this study, our research group proposes an application of Retinanet to develop a model capable of detecting hot spots in photovoltaic panels through thermal images.

Keywords: *photovolatic panel, hot spot detection, thermal images, machine learning.*

POSTER PRESENTATION (S5.03-P)

INTERGRATING GAS SENSOR TO BE AUTOMATICALLY OPENED THE ROLLING DOOE ON THE ESP8266 MICROCONTROLLER

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Abstract

This article, the ESP8266 microcontroller is applied to control the rolling door using both the Blynk application and push button control. The program is written in the open-source Arduino Software. Then, the rolling door is automatically opened when the gas level exceeds a predetermined threshold. The research results created the rolling door controller that used to replace push button control in households today.

Keywords: *Embedded programming, The ESP8266 microcontroller, Gas sensor*

POSTER PRESENTATION (S5.04-P)

RESEARCH WARNS OF ENVIRONMENTAL POLLUTION IN HIGH-RISE BUILDING BASEMENTS TODAY USING IoT TECHNOLOGY

Phong Nguyen Duyen, Tuyen Uong Quang, Minh Tran Tuan, Thanh Dang Trung and Thuc Ngo Van

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Abstract

Currently, in urban areas, most high-rise buildings have basements used as parking lots, shopping malls, restaurants, entertainment areas, etc., but the control of the basement environment has not received much attention. Within the framework of this study, the authors would like to present a method for warning about the level of environmental pollution in the basement using IoT technology. This method provides an early warning solution for the level of air pollution so that solutions can be found to limit the level of air pollution in the basements of high-rise buildings. Based on the early warning of that pollution level, the building can take measures to reduce pollution in the basement environment.

Keywords: *environmental pollution, high-rise building, IoT technolog*

Session 6. Computing Science, Simulation and Modeling

- Chair and Co-chair:
  - **Assoc. Prof. Huynh Van Tuan** (VNUHCM-US)
  - **Dr. Nguyen Quang Khoi** (VNUHCM-US)
- Secretary: **Phan Nguyen Thuan-MSc** (VNUHCM-US)
- Room: **202**, Mien Tay Construction University, Vinh Long Province, Vietnam
  - *Opening session: 7:30; Coffee break:*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	INVITED TALK S6.01-I Dr. **Nguyen Quang Khoi** (VNUHCM-University of Science, Vietnam)	Development of an efficient spectrum modeling of yellow phosphor with high accuracy for white LEDs applications
	INVITED TALK S6.02-I Prof. **Md. Mahabub Hossain** (*Hajee Mohammad Danesh Science & Technology University (HSTU)*)	Seamless real-time thermal imaging system with ESP8266 for wireless data transfer
	ORAL PRESENTATION S6.02-O **Kazuyuki Hanahara** (Iwate University, Japan)	Evaluation of Disassembling Process Inference based on Positional Relations Matrix
	ORAL PRESENTATION S6.02-O Mr. **Hien Pham Xuan** (VNUHCM-University of Science, Vietnam)	Improving the Performance of Actor-Critic PPO Model based on the Probability of Gaussian Distribution
	ORAL PRESENTATION S6.03-O **Anh Tran** (Ho Chi Minh City University of Technology)	Dynamic-Discrete-Set MPC for Interface Converters in Critical DC Micro-grids with Pulsed Loads

ORAL PRESENTATION S6.04-O **Nguyen Thi Le Thuy** (Faculty of Physics and Engineering Physics, University of Science, Ho Chi Minh City, Vietnam)	Introducing a novel surface electromyography signal dataset for hand movements classification
ORAL PRESENTATION S6.05-O **Khanh Quoc Truong** (Ho Chi Minh City University of Technology)	Enhancing Speed Response by Implementing Improved Sliding Mode Algorithm and Fuzzy Logic Law in Controlling PMSM
ORAL PRESENTATION S6.06-O **C. Si Hoang** (University of Science, VNUHCM)	When will Axial Seamount be erupted? Data-Driven Approaches to Volcanology
POSTER PRESENTATION S6.01-P **Binh Lam Van** (Ho Chi Minh City University of Technology)	Enhancing Decarbonized Microgrid Stability with Virtual-Impedance Droop Control for Capacitive-Coupling Inverters
POSTER PRESENTATION S6.02-P **Phuc Hong** (Ho Chi Minh City University of Technology)	Distributed Model Predcitive Secondary Control for Current Sharing Accuracy and Voltage Restoration for Islanded DC Microgrid
POSTER PRESENTATION S6.03-P **Duong Nguyen Trong Qui** (Ho Chi Minh City University of Technology)	Enhanced Speed Regulation of BLDC Motors Using Fuzzy-PID Control in Trapezoidal Schemes
POSTER PRESENTATION S6.04-P **Lan Tran** (VNU-HCM University of Science)	Quantum computing for challenging problems in chemistry, machine learning, and information
POSTER PRESENTATION S6.05-P **Anh Thu Nguyen** (University of Science, VNU-HCM)	Comparative performance analysis of U-Net and U-Net++ for Gastrointestinal Polyp Image Segmentation

INVITED TALK (S6.01-I)

Development of an efficient spectrum modeling of yellow phosphor with high accuracy for white LEDs applications

Quang-Khoi Nguyen, Quoc-Cuong Nguyen, Thi-Thu-Thuy Tran, Nha-Linh Tran, Khanh-Linh Truong, Van-Tuan Huynh and Huynh-Tuan-Anh Nguyen

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Abstract

We developed a useful method for modeling the emission of yellow phosphor material in both theoritical and emprical approach. The simplied mathematical model is developed based on the Gaussian function. Different emission spectrum is simulated and matching with experimental spectrum. The model's accuracy is quantitatively verified by the normalized cross-correlation algorithms which is possible quantitatively to define the similar level between the simulation and experiment results. The proposed model is not only helpful for spectrum modeling but also applicable in studying the optical properties of lorescences material with an asymmetric shape of emission spectrum.

Keywords: *optical model, color mixing, yellow phosphor, white LEDs modeling.*

INVITED TALK (S6.02-I)

Seamless real-time thermal imaging system with ESP8266 for wireless data transfer

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Abstract. Thermal imaging is a technology which enables it possible to observe the heat radiation that is released by humans, animals and objects. Nowadays, it has become progressively more prevalent because of its unique features in a variety of fields, including medical diagnostics, building automation and industrial monitoring. While thermal imaging offers compelling possibilities, currently available systems can be highly expensive and lack robust connectivity features. The present investigation has been carried out to build up a seamless real-time thermal imaging system with ESP8266 focusing on wireless data transfer and display capabilities using UDP protocol. We have proposed a method to overcome these challenges by employing the ESP8266 microcontroller to develop a thermal imaging system which was designed to measure thermal pixel values and also wirelessly transmit the data utilizing the networking capabilities of the ESP8266 and display the pixel data in real-time on a TFT display. The transmitter and receiver devices were connected to the same local network, guaranteeing efficient and low-latency transmission of thermal pixel data. The experimental results indicated that the system achieved real-time communication within a radius of approximately 15-18 meters, ensuring immediate visualization of thermal images on connected displays. The UDP protocol produced much faster pixel data display intervals, with a latency range of 0.531 to 2.372 seconds, compared to the HTTP protocol's 0.608 to 2.465 seconds and TCP protocol's 2.343 to 4.874 seconds for pixel data transmission from the client to the server. The system demonstrated its efficacy by successfully detecting both cold (37.85°F) and hot (183.20°F) objects in thermal images. Furthermore, it also provided a thermal image depicting the temperature of fingers, recorded at 24.00°C. The color-coded representation accurately identified regions emitting lower or higher levels of infrared radiation compared to their surroundings. So, it may be concluded that by minimizing latency the thermal imaging system enables a seamless and instantaneous image visualization for the users.

ORAL PRESENTATION (S6.01-O)

Evaluation of Disassembling Process Inference based on Positional Relations Matrix

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Abstract

Disassembling is an important process for maintenance, reparation, and disposal of mechanical as well as structural systems. More often than not, however, the disassembling processes are not prepared in advance; we need to organize the disassembling process based on the obtained arrangement information of the parts consisting the system to be disassembled. In order to deal with the various disassembling problem in general form, we are studying an approach based on positional relation information among the parts. On the basis of our approach, it is considered to be possible to formulate and to solve various disassembling problems.

In the current study, we evaluate the applicability of the disassembling process inference based on the positional relations matrix, that contains the positional relation information among the parts. We develop a disassembling problem generation based on random number generator. A random placement process based on a random walk is adopted to generate block-pattern-based disassembling problems. We demonstrate the generation of disassembling problems and evaluate the applicability of the proposed disassembling process inference with the generated problems.

Keywords: *disassembling process inference, positional relations matrix, problem generation, random walk, computation, modeling.*

ORAL PRESENTATION (S6.02-O)

Improving the Performance of Actor-Critic PPO Model based on the Probability of Gaussian Distribution

Hien Pham Xuan
Email:

Abstract

Making an optimal action for agents in an actor-critic PPO model from a finite discrete action set has shown certain drawbacks in real-world applications. One of the biggest challenges is pre-defining a suitable action set for each task. For this reason, in this paper, we present a solution to encourage agents to find out the most suitable action in the actor-critic PPO model. Specifically, the actions are trained from a continuous action space, which can be considered a diverse action set. The selection of actions from corresponding states is based on the probability density from a Gaussian distribution. To demonstrate the algorithm's effectiveness, we run the test in the OpenAI Gym simulation environment, which simulates the continuum space in its entirety. Our solution has opened a promising opportunity that aims to enhance the performance of the actor-critic PPO in training actions for agents, in which each action is selected meticulously from a diverse action set.

Keywords: *Reinforcement Learning, Gaussian process regression, PPO.*

ORAL PRESENTATION (S6.03-O)

Dynamic-Discrete-Set MPC for Interface Converters in Critical DC Micro-grids with Pulsed Loads

Anh Tran, Phuc Hong, Nhuan Le An, Duc Pham and Ly Trinh Thi

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Abstract

Pulsed loads in critical DC micro-grids necessitate energy storage with advanced interface converters, which require fast dynamics and excellent disturbance rejection. Additionally, these converters need voltage transformation and galvanic isolation capabilities due to the low voltage strings of common energy storage technologies like batteries and supercapacitors. To address these requirements, this paper proposes a Dynamic-Discrete-Set Model-Predictive-Control (DDS-MPC) method applied to a Dual-Active-Bridge converter. In this proposed control scheme, a constant switching frequency is maintained, facilitating the design of passive components. Moreover, the computational burden is reduced thanks to the advanced prediction approach. The control performance is then compared with conventional methods and evaluated using MATLAB simulations.

Keywords: *Pulsed loads, Energy storage, Dual-Active-Bridge converter, Critical DC micro-grids.*

ORAL PRESENTATION (S6.04-O)

Introducing a novel surface electromyography signal dataset for hand movements classification

Nguyen Thi Le Thuy, Thuan Phan Nguyet and Huynh Van Tuan

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Abstract

Surface electromyography (sEMG) signal classification plays a crucial role in the field of biomedical engineering, particularly in the development of prosthetics, rehabilitation devices, and human-computer interaction systems. sEMG signals, which represent the electrical activity of muscles, are commonly used to infer the intended movements of individuals. This paper introduces a novel dataset of surface lectromyography (sEMG) signals specifically curated for the classification of hand movements. It includes EMG recordings collected from a diverse group of subjects performing 15 hand movements under controlled conditions. Detailed descriptions of the experimental setup, data collection protocols, and signal preprocessing techniques are provided. Benchmark results using state-of-the-art classification techniques are also presented to demonstrate the dataset's utility and performance.

Keywords: *surface electromyography, dataset, hand movements classification.*

ORAL PRESENTATION (S6.05-O)

Enhancing Speed Response by Implementing Improved Sliding Mode Algorithm and Fuzzy Logic Law in Controlling PMSM

Khanh Quoc Truong, Son Huynh, Dung Hoang Vo and Minh Duc Pham

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Abstract

The increasing demand for high-performance Permanent Magnet Synchronous Motors (PMSMs) has spurred the development of PMSM speed control. Although the Proportional-Integral controller is often used in field-oriented control (FOC) for motor speed regulation, it has several disadvantages such as slow response and instability. To improve control stability and response, this study proposes an enhanced sliding mode control with an enhanced sliding surface. In comparison to conventional sliding mode control, the proposed method defines a new-reaching law that incorporates a fuzzy logic control support system. The proposed approach aims to achieve smoother and faster response times compared to conventional sliding mode control. The effectiveness of the proposed enhanced sliding mode control is validated through practical small-scale PMSM experiments.

Keywords: *Permanent magnet synchronous motor (PMSM), enhanced sliding mode control, chattering reduction, time response.*

ORAL PRESENTATION (S6.06-O)

When will Axial Seamount be erupted? Data-Driven Approaches to Volcanology

C. Si Hoang, T. Vuong Thien, T. Sang Ngo, N.T. Nguyen Tran, N.C. Ly Ngo, T. Phuc Nguyen, S. Huy Gip, T. Hoa Nguyen, N.A. Minh Tran and V.T. Ngan Nguyen

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Abstract

Located on the Juan de Fuca Ridge in the Pacific Northwest, Axial Seamount is one of the world's most active and intensely studied underwater volcanoes. In April 2015, it experienced a significant eruption, which gave scientists an unprecedented chance to observe seafloor spreading and volcanic activity in real time. The Ocean Observatories Initiative (OOI) has improved monitoring efforts at Axial Seamount by d+G41eploying cutting-edge oceanographic instruments. Among these instruments is the Cabled Observatory Vent Imaging Sonar (COVIS), a sophisticated sonar system to monitor hydrothermal plumes and volcanic activity. COVIS collects detailed data on the volume, velocity, and distribution of hydrothermal plumes, as well as on the heat flux from the seafloor. To fully leverage this data, we utilized MATLAB for extraction and Python for processing, enabling us to create sophisticated visualizations, including a time-lapse that captures the dynamic changes in Axial Seamount's activity. With these visualizations, we hope to bring a more visual approach to scientists and enhance predictive models for future events, potentially offering insights into broader tectonic processes in the region.

Keywords: *Axial Seamount, COVIS, Visualization, Big data.*

POSTER PRESENTATION (S6.01-P)

Enhancing Decarbonized Microgrid Stability with Virtual-Impedance Droop Control for Capacitive-Coupling Inverters

Binh Lam Van, Phuc Lam Hong and Duc Pham Minh

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Abstract

Capacitive-Coupling Inverters (CCI) offer significant advantages in modern power systems, especially within decarbonized microgrids, due to their low operating voltage and improved reactive power control capabilities. These inverters are promising for providing effective reactive power support and voltage regulation, which increases overall system stability and efficiency. However, conventional control scheme often fall short in optimizing CCI performance due to inherent power coupling issues and uncertainties in feeder impedance. To address these challenges, this study proposes a virtual-impedance droop control scheme. This approach involves selecting appropriate virtual impedance to mitigate power coupling between active and reactive power and adjusting the equivalent impedance in real-time. Simulation results confirm the potential of the proposed method, thereby helping to improve the operational efficiency of CCI in decarbonized microgrids.

Keywords: *Capacitive-Coupling Inverters (CCI), Decarbonized Microgrid, Reactive power control, Voltage regulation, Virtual-impedance droop control, Power coupling.*

POSTER PRESENTATION (S6.02-P)

Distributed Model Predcitive Secondary Control for Current Sharing Accuracy and Voltage Restoration for Islanded DC Microgrid

Phuc Hong, Duc Pham Minh and Hung Nguyen Duc

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Abstract

As the transition from fossil energy sources to renewable energy sources accelerates, the significance of islanded DC microgrid architectures and their corresponding control methodologies is increasingly recognized. Although the droop control method is prevalently utilized, its effectiveness is undermined by the system susceptibility todifferences in line resistance. To address this challenge, implementing a proportional-integral (PI) controller-based secondary controller is a common adopted, requiring careful calibration of the controller stability and control response parameters. This study introduces a model-based predictive control (MPC) approach as a substitute for the PI controller within the secondary control scheme, aiming to maintain stability while achieving a rapid response. The proposed distributed model predictive secondary control is evaluated through MATLAB/Simulink simulations with the aim of highlighting the improvement in system reliability and control quality.

Keywords: *Islanded DC Microgrid, Droop control method, Secondary control, Model Predictive Control (MPC).*

POSTER PRESENTATION (S6.03-P)

Enhanced Speed Regulation of BLDC Motors Using Fuzzy-PID Control in Trapezoidal Schemes

Duong Nguyen Trong Qui, Nhuan Le An and Duc Pham Minh

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Abstract

This paper explores an enhanced method for regulating the speed of Brushless DC (BLDC) motors using a trapezoidal control scheme. Traditionally, a PI (Proportional-Integral) controller is employed to adjust the output voltage of an external DC-DC converter, which in turn controls the input voltage to the BLDC motor. While the PI controller is straightforward and effective in many scenarios, it exhibits limitations such as poor performance under varying load conditions and slower response to rapid changes. To address these limitations, a Fuzzy-PID control scheme is proposed in this study with the aim of improving the speed control performance of BLDC motors, especially under rapidly changing load profiles. The Fuzzy-PID controller combines the robustness of fuzzy logic with the precision of PID control, offering several advantages over conventional PI controllers. These advantages include enhanced adaptability to dynamic conditions, reduced steady-state error, and improved transient response. Simulation results demonstrate that the Fuzzy-PID control scheme significantly outperforms the traditional PI controller in terms of BLDC stability, response time, and accuracy. The proposed approach ensures more reliable and efficient speed regulation for BLDC motors, making it a reliable solution for applications where load conditions fluctuate frequently.

Keywords: *BLDC Motor, Trapezoidal Control Scheme, Speed Regulation, Load Variation.*

POSTER PRESENTATION (S6.04-P)

Quantum computing for challenging problems in chemistry, machine learning, and information

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Abstract

Quantum computing is an emerging technology that is expected to tackle unsolvable problems of classical computing. In this talk, I will discuss our recent research about the development of quantum computing algorithms for applications in chemistry, machine learning, and information. For chemistry, we have developed a quantum-classical hybrid approach to molecular electronic-structure properties [1]. For machine learning, we have implemented a quantum package supporting quantum neural networks for practical applications [2]. For quantum information, we have developed a multi-target quantum compilation for thermal state preparation and quantum dynamics [3].

[1] Nhan T. Tran, Lan N. Tran, "Correlated reference-assisted variational quantum eigensolver", The Journal of Physical Chemistry A 127 (24), 5222–5230, 2023

[2] Chuong Q. Nguyen, Ho B. Le, Lan N. Tran, and Hung Q. Nguyen, "Qsun: an open-source platform towards practical quantum machine learning applications", Machine Learning: Science and Technology 3 (1), 015034, 2022

[3] Hai T. Vu, Lan N. Tran, Ho B. Le, "Multi-target quantum compilation algorithm", submission, 2024

Keywords: *quantum computing, computational chemistry, machine learning, quantum information.*

POSTER PRESENTATION (S6.05-P)

Comparative performance analysis of U-Net and U-Net++ for Gastrointestinal Polyp Image Segmentation

Anh Thu Nguyen and Van Tuan Huynh

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Abstract

The development of deep learning has profoundly impacted medical image analysis, particularly in image segmentation, enabling quick and accurate diagnoses through image data. This study focuses on the segmentation of gastrointestinal polyps using two deep convolutional neural network models, U-Net and U-Net++. Data augmentation techniques are applied to enhance the dataset and improve accuracy. Performance is evaluated using metrics such as Intersection over Union (IoU), Dice coefficient, and accuracy. Our results demonstrate that while U-Net provides strong baseline performance, U-Net++ achieves superior segmentation accuracy, particularly in capturing complex details. This research highlights the pivotal role of deep learning architectures in medical image segmentation and provides essential insights for developing more accurate automated diagnostic tools.

Keywords: *Deep learning, Medical image analysis, Image segmentation, Gastrointestinal polyps, U-Net, U-Net++.*

PARALLEL SESSION

Session 7. Architectures, Urban planning and Constructions

- Chair and Co-chair:
  - . **Dr. Wen-Yi Hung** (NCU, Taiwan)
  - . **Dr. Truong Cong Bang** (MTU, Vietnam)
- Secretary:
  - . **MSc. Nguyen Phuoc Hoang Khang** (VNUHCM-US)
  - . **MSc. Nguyen Tan Phat** (MTU)
- Room **203**, Mien Tay Construction University, Vinh Long Province, Vietnam
  - *Opening session: 7:30; Coffee break:*
  - *Invited talk: 15 minutes (presentation: 12 mins + 3 mins Q&A)*
  - *Oral talk: 12 minutes (presentation: 10 mins + 2 mins Q&A)*

Schedule	*Speakers*	*Title of talks*
	INVITED TALK S7.01-I Prof. **Wen-Yi Hung** *(National Central Univwersity, Taiwan)*	Innovative Approaches to Slope Stability Analysis Using Centrifuge Modeling.
	INVITED TALK S7.02-I Assoc. Prof. Dr. **Bui Quoc Bao** *(Ton Duc Thang University, Vietnam)*	Investigation on the development of non-fired materials without cement.
	ORAL PRESENTATION S7.01-O Assoc. Prof. Dr. **Tran Tuan Minh** *(Hanoi University of Mining and Geology, Vietnam)*	The effects of joint networks on the stability of two parallel tunnels.
	ORAL PRESENTATION S7.02-O Dr. **Lam Ngoc Qui** *(Mien Tay Construction University, Vetnam)*	Evaluation of the pile group effect on the bearing capacity of precast reinforced concrete piles on soft soil.
	ORAL PRESENTATION S7.03-O Dr. **Trong Nhan Huynh** (Mien Tay Construction University)	Evaluating urban expansion of Mekong Delta's cities: A Case Study of Tra Vinh City.

	ORAL PRESENTATION S7.04-O Dr. **Do Duy Thinh** (Ho Chi Minh city University of Technology and Education)	Identifying Da Lat identity using Environment-behavior studies.
	ORAL PRESENTATION S7.05-O Dr. **Duy Tran Quang** (Faculty of Civil Engineering, Nha Trang University)	Strategies to enhance capacity of a traffic intersection: case study in Nha Trang city.
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.01-P Dr. **Tùng Nguyễn** (Mien Tay Construction University)	Rethinking waterfront infrastructure through strategic placemaking approach. The cases of the Vietnamese Mekong Delta City of Vinh Long.
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.02-P Dr. **Nguyen Tan Loi** (Mien Tay Construction University, Vietnam)	Impacts and solutions to improve investment cost management.
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.03-P Dr. **Lê Thị Thu Hằng** (Mien Tay Construction University)	Use the diagramming method to determine the mixing ratio of components of river sand and crushed sand for concrete..
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.04-P Dr. **Do Duy Thinh** (Ho Chi Minh city University of Technology and Education)	An investigation of how Nguyen Van book street is used?.
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.05-P **Vo Ba Huy** (Urban Infrastructure Faculty, Mien Tay Construction University)	Study on the use of fly ash in cement treated aggregate base for road pavement to meet the strength requirements of pavement construction.
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.06-P Dr. **Do Duy Thoi** (Ho Chi Minh City University of Technology and Education)	Research on the water stability performance of modified asphalt mixtures with additives.
7:15:00 AM- 10:30:00 AM	**POSTER PRESENTATION** S7.07-P Dr. **Do Duy Thoi** (Ho Chi Minh City University of Technology and Education)	A simulation study of an urban traffic light control system based on multi-agent modeling.

INVITED TALK (S7.01-I)
Innovative Approaches to Slope Stability Analysis Using Centrifuge Modeling

Wen-Yi Hung[1,*] Minh-Canh Tran[1], Ida Agustin Nomleni[1]

[1] *Department of Civil Engineering, National University, Taiwan (R.O.C)*

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Abstract

In geotechnical engineering, centrifuge modeling has been instrumental in simulating prototype conditions through scaled-down models, accurately replicating soil behavior, including stress and strength responses. This method is widely employed to investigate various geotechnical challenges, with slope stability being one of the more complex issues to address. To gain a deeper understanding of slope behavior under diverse conditions and to evaluate advanced stabilization techniques, the NCU-GCST Lab has conducted a series of studies focusing on slope stability under gravitational forces, rainfall, and seismic activity [1]. The findings indicate that the orientation of gravel layers significantly influences water content distribution within the slope. Additionally, the slope angle has been identified as a critical factor affecting slope stability, while rainfall intensity plays a pivotal role in water infiltration. Furthermore, centrifuge modeling has been applied to explore strategies for enhancing slope stability, including simulating the impact of root systems and the use of C-RHA piles to increase shear strength resistance [2]. The research also demonstrates that precast construction methods substantially improve slope stability immediately after installation, as the strength of precast piles is fully realized before cast-in-place concrete reaches full curing strength.

Keywords: centrifuge modeling, slope stability, earthquake, rainfall, C-RHA

References:

[1] Wen-Yi Hung, Minh-Canh Tran, Fu-Hsuan Yeh, Chih-Wei Lu, and Louis Ge. (2020 Jun), "Centrifuge modeling of failure behaviors of sandy slope caused by gravity, rainfall, and base shaking," *Engineering Geology*, Vol. 271. ISSN 0013-7952.

[2] Wen-Yi Hung, Ida Agustin Nomleni, Dicky Pratama Soegianto, Nurza Purwa Abiyoga, Dwi Agrina (2023 Jul) "Centrifuge Modeling on the Slope Stability Reinforced by C-RHA Piles," *Acta Geotechnica*, ISSN 1861-1125

INVITED TALK (S7.02-I)

Investigation on the development of non-fired materials without cement

Quý Thương Lâm and Quoc Bao Bui

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Abstract

Bricks are commonly used in the construction industry. Although traditional clay fired bricks have many advantages, the production of clay fired bricks leads to loss of agricultural land and emits a large amount of CO2 during the firing process. Therefore, in recent years, fired clay bricks have been required to be replaced by non-fired bricks. Common types of non-fired bricks include cement-based bricks, autoclaved aerated concrete bricks, and lightweight concrete bricks. Although these bricks are non-fired, the cement amount used is still significant. The production of Portland cement emits a large amount of CO2, causing environmental pollution, and contributing to greenhouse gas emissions. Therefore, reducing the impacts of Portland cement, or finding an alternative binder to replace Portland cement are being sought worldwide. The main scope of the present investigation is to explore the application of geopolymer to substitute cement in the production of non-fired materials, specifically pavement bricks (flooring tiles, wall tiles). The research team utilizes fly ash (FA) in the production process to create geopolymer. FA is the residue produced during the coal combustion process in thermal power plants. The amount of FA emitted from thermal power plants in Vietnam is significant. Utilizing FA in the production of building materials also contributes to the recycling of industrial by-products, thereby reducing the environmental impacts. First, the composition of geopolymer was investigated and optimized. The compressive strength of geopolymer paste obtained was 60 MPa. Then, the pavement bricks have been produced from the geopolymer paste. Several aspects relative to the products obtained (finishing, aesthetic…) are presented and discussed.

Keywords: *non-fired bricks, fly-ash-based geopolymer bricks, pavement*

ORAL PRESENTATION (S7.01-O)

The effects of joint networks on the stability of two parallel tunnels

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Abstract

The development of transport infrastructure connecting the regions in Vietnam is increasingly receiving attentions. Highways are being built throughout all the regions of country. Due to the complex mountainous topographic, the process of forming and building highways in Vietnam will be required the construction of tunnels through the mountains. The excavation of mountain traffic tunnels as well as subway tunnels are often used two parallel tunnels to increase transport capacity and convenience in operating the tunnels. Currently, two parallel tunnels analysis problems are often applied the assumptions for tunnels with circular cross-sections in an elastic and isotropic medium, the ground surface is assumed to be flat, and the two tunnels are in a half infinite space by using the numerical analysis models. Two parallel tunnels with other different cross-sections for different purposes under varies ground surface conditions by variable complex method and numerical models have also been studied. However, the researches of the excavation twin parallel tunnels through mountains in the complex geological conditions including stratification rock mass, joint networks, and karst caverns are still many limitations. Therefore, in-depth researches will be performed to ensure effective excavation, support and use of tunnels.

Keywords: *parallel tunnels, slopes, non-circular tunnels, rock bolts, shotcrete, numerical simulation*

ORAL PRESENTATION (S7.02-O)

Evaluation of the pile group effect on the bearing capacity of precast reinforced concrete piles on soft soil

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Abstract

When constructing projects with large loads, reinforced concrete piles play an important role in transferring the load to the soil around and under the pile tip. The load-bearing capacity of the pile includes the pile tip resistance and the friction resistance between the pile and the soil layers. In order to increase load-bearing capacity, the foundation combines with many piles. This article calculates the coefficient of pile groups considering pile spacing and the number of piles in a foundation using analytical methods and finite element methods. Research results have shown that the value of the pile's group coefficient is calculated according to Plaxis 3D software and some authors such as Converse - Labarre (1941), Sayed and Baker, and Das (1998), there is a consistent rule that the coefficient of the pile group increases gradually from few piles to many piles and gradual increases with pile distance from (3 □ 6)d. The coefficient of the pile group is calculated according to the formula of Feld (1943) gradually decreases according to the rule from few piles to many piles, and it does not change with the pile arrangement distance from (3 □ 6)d. Calculation results using Plaxis 3D software give a group coefficient value that is smaller than when calculated according to analytical methods.

Keywords: *concrete pile, bearing capacity, pile's group coefficient, finite element method*

ORAL PRESENTATION (S7.03-O)

Evaluating urban expansion of Mekong Delta's cities: A Case Study of Tra Vinh City

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Abstract

In the Mekong Delta Region Planning for the period 2021–2030, with a vision to 2050, the consultancy firm Royal HaskoningDHV assessed that the urban areas in the Mekong Delta Region have a low urbanization rate (25% in 2019) and a slow urbanization rate (1.07% per year). With the expansion of administrative boundaries, the actual urbanization rate is even lower than the published figures. Therefore, identifying the actual boundaries of urban areas is essential to supporting the assessment of the current status and the overall planning orientation. In this article, Tra Vinh City, which is in the process of adjusting the urban master plan, is selected as a case study. The research team use the data fusion method combined with Sentinel-2 and Sentinel-1 satellite data to analyze the urban areas with high accuracy. Combined with a proximity algorithm, the results show that the actual urban structure of Tra Vinh is much smaller than both the current administrative boundaries and the expanded boundaries according to the master plan. The paper also propose solutions for organizing the urban structure to develop appropriately with the current conditions and the future development goals of Tra Vinh City.

Keywords: *urban expansion, remote sensing, Mekong Delta, Tra Vinh*

ORAL PRESENTATION (S7.04-O)

Identifying Da Lat identity using Environment-behavior studies

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Abstract

Nguyen Van Binh Book Street is a cultural destination that is highly appealing due to its diverse and lively activities. It is an ideal location for cultural and artistic activities and serves as a meeting and interaction space for book enthusiasts. At present, there are plans to expand and replicate the book street model in a variety of other locations. The question at hand is whether the new book streets can achieve the same level of efficacy and appeal as the current one. Nguyen Van Binh Book Street not only fulfills the desire for reading, but also establishes an environment that fosters cultural exchange, entertainment, and education among urban residents. A variety of components of the book street are assessed through user surveys, feedback synthesis, and field observations in the research methodology. This research assists in the enhancement of the urban public environment by elucidating the function and efficacy of the book street in public life. The research endeavors to establish public spaces that are more conducive to the community's various activities and to cultivate a vibrant, multi-colored environment.

Keywords: *Nguyen Van Binh Book Street, Public space, Reading culture, Urban sustainable development*

ORAL PRESENTATION (S7.05-O)

Strategies to enhance capacity of a traffic intersection: case study in Nha Trang city

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Abstract

With the increasing urbanization in large cities, congestion at intersections has become a critical issue, necessitating effective solutions to enhance traffic capacity at these points. This study presents a methodology to improve intersection traffic capacity using VISSIM and 3D modeling software. Initially, we survey and analyze the current state of the intersection. Subsequently, we develop research proposals and preliminary designs for various solution groups. These solutions are then analyzed based on average delay time, complexity level and feasibility in construction factors. Finally, we recommend specific solutions, create detailed designs, and develop visual 3D models. We implemented an experimental project to assess the effectiveness of the proposed method. The results indicate that using VISSIM and 3D modeling is promising for evaluating traffic solutions, improving investment efficiency, and visualizing projects.

Keywords: *Traffic congestion, Intersection capacity, 3D modeling intersection, VISSIM simulation, Enhancing effective intersection.*

POSTER PRESENTATION (S7.01-P)

Rethinking waterfront infrastructure through strategic placemaking approach. The cases of the Vietnamese Mekong Delta City of Vinh Long

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Abstract

Waterfront infrastructure is being prioritized for investment as an inevitable result to counteract the phenomenon of riverbank erosion taking place throughout the Vietnamese Mekong Delta region. In urban areas, these projects are identified as multifunctional infrastructure that operates as public spaces. Although the projects are expected to change the urban appearance and improve residents' life quality, the top-down planning approach limits their potential and socio-economic impact. This paper investigates the role of the strategic placemaking approach in rethinking the waterfront infrastructure in the context of the Vietnamese Mekong Delta through the case of Vinh Long City. Based on the inheritance and evaluation of documents combined with empirical work and mapping method, the relationship between waterfront infrastructure and public spaces with the citizen will be presented. Then, research by design scenarios shows the reflection of strategic placemaking in rethinking the development of the city waterfront. The result shows the importance of prioritizing the role of residence in the design and planning process to ensure the success of an urban space and urban infrastructure. The strategic placemaking approach makes an important contribution to the current urban planning process and the sustainable development strategy of the riverine urban areas in the Vietnamese Mekong Delta region.

Keywords: *waterfont infrastructure, waterfront public space, strategic placemaking, Vietnamese Mekong Delta City*

POSTER PRESENTATION (S7.02-P)

Impacts and solutions to improve investment cost management

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Abstract

Cost control and management is essential for all organizations, focusing on the effective utilization and maximization of state budget capital in construction investment. By managing and controlling investment costs efficiently, organizations can save on expenses, prevent losses and waste of state budget capital, and contribute to socio-economic development. Consequently, it is essential to analyze and evaluate the factors influencing investment cost management, and to propose solutions aimed at enhancing investment cost management within the Project Management Board of Tan Hong district, Dong Thap province. The study has identified 19 factors that influence the management of construction progress, categorizing them into 7 distinct groups of influencing factors. The factors will be incorporated into the Cronbach's Alpha reliability test using SPSS software to analyze the data, ascertain the Cronbach's Alpha coefficient for the observed variables, and the author will conduct exploratory factor analysis (EFA). Based on the analysis of the influencing factors mentioned above, the author suggests several targeted solutions tailored to the local context aimed at improving and enhancing the management of investment costs for construction projects in Tan Hong district, Dong Thap province. These include: a set of solutions focused on the capabilities of design consultants, a set of solutions addressing the competencies of the Project Management Board, a set of solutions concerning state management policies and regulations in Tan Hong district, and a set of solutions related to the responsibilities of the investor in Tan Hong district. A collection of solutions pertaining to project implementation experience, a collection of solutions addressing unforeseen conditions, and a collection of solutions concerning the construction contractor

Keywords: *management, investment, cost management, contractor, SPSS*

POSTER PRESENTATION (S7.03-P)

Use the diagramming method to determine the mixing ratio of components of river sand and crushed sand for concrete.

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Abstract

Within the framework of the construction of industry continued efforts to address societal demands, numerous significant projects have commenced their building phase, resulting in a surge in the extraction of river sand. This escalation in sand exploitation has subsequently engendered various consequences that directly affect the well-being of individuals. Both human activities and environmental factors contribute to pollution. The urgent need to identify alternative materials for partial substitution of river sand is a practical concern. Additionally, the challenge of effectively blending materials with varying compositions into a standardized combination is a problem that necessitates resolution. This study uses diagramming and experimental methodologies to ascertain the optimal mixing ratio of crushed sand particles and river sand in concrete mixtures for the Campus B Project at Mien Tay Construction University. The research findings serve as a foundation for construction contractors and investors in their selection of suitable mixing ratios.

Keywords: *River sand, crushed sand, fine sand, concrete, diagramming method*

POSTER PRESENTATION (S7.04-P)

An investigation of how Nguyen Van book street is used?

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Abstract

Nguyen Van Binh Book Street is a cultural destination that is highly appealing due to its diverse and lively activities. It is an ideal location for cultural and artistic activities and serves as a meeting and interaction space for book enthusiasts. At present, there are plans to expand and replicate the book street model in a variety of other locations. The question at hand is whether the new book streets can achieve the same level of efficacy and appeal as the current one. Nguyen Van Binh Book Street not only fulfills the desire for reading, but also establishes an environment that fosters cultural exchange, entertainment, and education among urban residents. A variety of components of the book street are assessed through user surveys, feedback synthesis, and field observations in the research methodology. This research assists in the enhancement of the urban public environment by elucidating the function and efficacy of the book street in public life. The research endeavors to establish public spaces that are more conducive to the community's various activities and to cultivate a vibrant, multi-colored environment.

Keywords: *Nguyen Van Binh Book Street, Public space, Reading culture, Urban sustainable development*

POSTER PRESENTATION (S7.05-P)

Study on the use of fly ash in cement treated aggregate base for road pavement to meet the strength requirements of pavement construction

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Abstract

This article presents initial research results on using fly ash to partially replace cement in cement treated aggregate base. The experiment was performed on 3 groups of samples with a cement ratio of 4%; 5% and 6% in the mix. For each group of samples, replace fly ash with a corresponding rate of 0%; 15%; 25%; 35%. Then, perform experiments to determine compressive strength at 7 days and 14 days. The experimental results are used to evaluate the use of the above aggregates for cement treated aggregate base for road pavement.

Keywords:

POSTER PRESENTATION (S7.06-P)

Research on the water stability performance of modified asphalt mixtures with additives

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Abstract

The water stability performance of asphalt mixtures is an important index to evaluate the quality of asphalt mixtures. In this article, we aim to enhance the resilience of asphalt concrete pavement against water damage in rainy climate conditions such as Vietnam by utilizing a modified asphalt mixture with two distinct types of additives (TPS and AP-8), which are the research subjects. Using three different amounts of each type of additive, we create six samples of the modified asphalt mixture and one sample of the base asphalt mixture. We measure the water stability indexes of seven asphalt mixture samples, both before and after soaking, using the Marshall immersion test method. From there, analyze and evaluate the impact of each additive's content on the water stability of the improved asphalt mixtures studied in comparison to the base asphalt mixture.

Keywords: *water damage resistance, water stability performance, modified asphalt mixture, TPS additives, AP-8 additives*

POSTER PRESENTATION (S7.07-P)

A simulation study of an urban traffic light control system based on multi-agent modeling

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Abstract

With the rapid development of current traffic vehicles in major cities around the world, traditional urban traffic light control systems cannot allocate traffic light cycle times at intersections optimally, causing traffic congestion to become increasingly serious. With the support of Netlogo software, on the basis of multi-agent modeling, we have built an optimal simulation model of light cycle time for the problem of balancing actual traffic volume and cycle time lights at traffic intersections. We use the optimal light cycle length algorithm to calculate the traffic light cycle time within the most suitable range. The traffic flow at the intersection is set manually, thereby analyzing the effectiveness of the traffic light cycle time with the traffic flow. A loop to vary the traffic light cycle time within a reasonable computational range was applied. The final result is that, through the simulation model, traffic light cycle times can be optimally and flexibly adjusted to different traffic flows.

Keywords: *Multi-agent systems, Netlogo, Urban Traffic Light, Traffic control, Traffic Simulation*

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