The 2nd Workshop on Micro/nano Systems and Their Application
(2nd WMSA)
VNUHCM-University of Science, Nov 5th, 2019

Venue: 227 Nguyen Van Cu Street, District 5, Hochiminh City, Vietnam

Abstract and Program

The 2nd Workshop on Micro/Nano Systems and Their Appications
(2nd WMSA2019)

VNUHCM-University of Science, Vietnam
Nov 05th, 2019

Organizers:

Publications: IKEEE (Korea)

HSIA

TOHOKU

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AGENDA

The 2nd Workshop on Micro/Nano Systems and Their Applications *(2WMSA)*

Time	Speakers	Name and note
13:00-13:20	- Introduce guests and Program - Welcome speech from VNUHCM-US (Prof. Tran Minh Triet, Vice president) - Welcome speech from HSIA (Mr. Nguyen Anh Tuan, President) - The signing MoU between Ono Lab and Dept.P&EE about the cooperation activities	MC: Dr. **Ho Thanh HUY** (VNUHCM-US)
Session 1: Chair: Prof. Nguyen Van TOAN (TU, Japan)		
13:20-13:40	Prof. Takahito ONO Tohoku University	Micro/nano systems for IoT sensor applications
13:40-15:00	Prof. Nguyen Van HIEU VNUHCM-University of Science	The applications of biosensors in safe foods
15:00-15:20	Prof. Vu Thi Hanh THU VNUHCM-University of Science	Hydrogen generation of Photocatalytic reaction
15:20-15:35	**Poster session and Coffee break**	Lobby of F.102, Mr. QUAN
Session 2: Chair: Dr. Nguyen Chi NHAN (VNUHCM-US, Vietnam)		
15:40-16:00	Prof. Le Vu Tuan HUNG VNUHCM-University of Science	Fabrication surface enhanced Raman scattering-SERS based on structure of nano Silver and Gold nano decorated on ZnO nanorods for detecting residual pesticide
16:00-16:20	Prof. Hoang TRANG VNUHCM-University of Technology,EEE	The Simulation Study of Process Variation on Threshold Voltage in 180nm Floating-Gate device
16:20-16:40	Prof. Nguyen Van TOAN Tohoku University, Japan	Metal-Assisted Chemical Etching Method Subjected to Micro/Nano Device Systems
16:40-16:50	Prof. Takahito ONO	Conclusions and Remarks
Group Photos (all participants)		Mr. Quan
Session 3: Discusions on the proposal research and education program **Chair: Prof. Nguyen Van HIEU** (VNUHCM-US, Vietnam)		
17:00-17:30	*TU: Prof. Ono and Prof. Toan;* *VNUHCM-US: Prof. Hieu, Prof. Hung, Prof. Thu, Dr. Nhan, Dr. Huy* *HSIA: Mr. Tuan and others*	
18:00-21:00	**Welcome Dinner party** (Deptaure:17:45 by walk,300m)	Phuc An Khang Restaurant (German Beer)

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TOHOKU

1.Introduce guests and Program (MC)

2. Welcome speech from VNUHCM-University of Science, Hochiminh City, Vietnam (VNUHCM-US)

Prof. Tran Minh Triet, Vice president

3. Welcome speech from Hochiminh City Semiconductor Industry Association(HSIA)

Mr. Nguyen Anh Tuan, President

4. The signing MoU Ceremony

The 2nd Workshop
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Venue: 227 Nguyen Van Cu Street, District 5, Hochiminh City, Vietnam

1.Time: at 13:00, November, 5th 2019 (Tue)
2.Venue: F.102 (Building F, 1st floor)
University of Science, 227 Nguyen Van Cu Street, District 5, Ho Chi Minh City, Viet Nam
3.Organization:
- VNUHCM-University of Science, Ho Chi Minh City, Viet Nam (VNUHCM-US)
- Tohoku University, Sendai, Japan (TU)
- Hochiminh City Semiconductor Industry Association (HSIA)

List of Invited Speakers and Participants

1.From Japan

No	*Name*	*Universities/organizations*	*Signature*
1	Prof. Takahito ONO	Mechanical Systems and Design, Tohoku University, Sendai	
2	Prof. Nguyen Van TOAN	Mechanical Systems and Design, Tohoku University, Sendai	
3	Ms. Truong Thi Kim TUOI	Mechanical Systems and Design, Tohoku University, Sendai	

2. From Vietnam

No	Name	Universities/organizations	Signature
1	Prof. Tran Minh TRIET	Vice President, VNUHCM-US	
2	Mr.Nguyen Anh TUAN, MSc	President, HISA	
3	Prof. Tran Van MAN	Head, Office of S&T, VNUHCM-US	
4	Dr. Vo Hong HAI	Deputy Head, Office of External Relations, VNUHCM-US	
5	Prof. Le Vu Tuan HUNG	Dean, Faculty of Physics and Engineering Physics, VNUHCM-US	
5	Prof. Nguyen Van HIEU	Head, Dept.of Physics and EE, Faculty of P&EP, VNUHCM-US, Co-chair of 1st WMSA	
6	Prof. Hoang TRANG	Head, Department, Faculty of EEE, VNUHCM-University of Technology	
7	Prof. Vu Thi Hanh THU	Faculty of Physics and Engineering Physics, VNUHCM-US	
8	Mr. Dang Cong THINH	Faculty of EEE, VNUHCM-University of Technology	
9	Dr. Nguyen Chi NHAN	Deputy Head, Dept.of Physics and EE, Faculty of P&EP, VNUHCM-US	
10	Dr. Ho Thanh Huy	Vice Director, Research Center for Hi-tech Applictions on Agriculture, VNUHCM-US	
11	Nguyen Hoang QUAN, MSc	Dept.of Physics and EE, Faculty of P&EP, VNUHCM-US	
12	Thai Thi Xuan Dieu	Dept.of Physics and EE, Faculty of P&EP, VNUHCM-US	

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Venue: 227 Nguyen Van Cu Street, District 5, Hochiminh City, Vietnam

Session 1.

Chair: Prof. **Nguyen Van TOAN**
Tohoku University, Semdai, Japan
Room: F.102, Building F

Time	*Name of Invited Talks*
13:20-13:40	**Invited talk 1.1:** Prof. Prof. Takahito ONO Tohoku Univ., Japan Title: Micro/nano systems for IoT sensor applications
13:40-15:00	**Invited talk 1.2:** Prof. Nguyen Van HIEU VNUHCM- University of Science Title: The applications of biosensors in safe foods
15:00-15:20	**Invited talk 1.3:** Prof. Vu Thi Hanh THU VNUHCM- University of Science Title: Hydrogen generation of Photocatalytic reaction

Invited talk 1.1:

Title: **Micro/nano systems for IoT sensor applications**

Speaker: Takahito ONO

Mechanical Systems and Design, Tohoku University, Sendai, Japan

Abstract:

Internet of Things (IoT) technologies have been rapidly developed and gain its importance for world-wide issues including aging society, environments, and energies, where micro/nanosystem and high sensitive and functional microsensors are key-technologies for IoT. Ono laboratory has been studying such sensor technologies and related technologies. Microelectromechanical systems (MEMSs) and Nanoelectromechanical systems (NEMSs) are miniaturized systems with additive values, which are fabricated by micro/nanofabrication technologies in addition to conventional semiconductor technologies. Ono laboratory are working on those technologies including micro/nanofabrication, nanomaterial technologies, novel MEMS/NEMSs and related technologies for IoT sensor applications.

BIOGRAPHY: Prof. Takahito ONO

Takahito Ono is currently a professor at Mechanical Systems Engineering, Graduate School of Engineering in Tohoku University. He was born in Hokkaido, Japan, on 12 July 1967. He received the B.S. degree in physics from Hirosaki University, Japan, in 1990 and an M.S. degree in physics from Tohoku University, Japan. He received a doctor of engineering in mechatronics and precision engineering from Tohoku University in 1996. During 1996–2001, he was a research associate and lecturer in the Department of Mechatronics and Precision Engineering, Tohoku University. He studied nanomachining and the scanning probe and its related technologies including high-density storage devices. During 2001–2009, he was an associate professor and developed nanomechanics and nanomechanical sensors. Since 2009, he has been a professor at Tohoku University. His expertise is in the areas of microelectromechanical systems (MEMS), nanoelectromechanical systems (NEMS), silicon-based nanofabrication, and ultrasensitive sensing based on NEMS/MEMS. Also during 2012–2014 he was director of the Micro/Nanomachining Research and Education Center, Tohoku University. Since 2017 he has served as a director of Micro System Integration Center (μSiC), Tohoku University. During 2013-2016, he has held the additional post of Professor of Guest Courses, Mechanical Departments, University of Tokyo, and is working on nanomechanics. He is editor in chief of IEEJ Transactions on Sensors and Micromachines, editor member of Microsystems & Nanoengineering, and advisory board member of Journal of Micromechanics and Microengineering. His expertise is in the area of microelectromechnical systems (MEMSs), nanoelectromechanical systems (NEMSs), silicon-based nanofabrication, and ultra-sensitive sensing based on resonating device. Recent interests cover nanomaterials and their process integration, biomedical sensors, and micro energy.

Invited talk 1.2:

Title: **The applications of biosensors in safe foods**

Speaker: Nguyen Van HIEU

EEE Lab, Dept.of Physics and EE, Faculty of P&EP, VNUHCM-US, HCM City, Vietnam

Abstract:

The aquaponics is the simultaneous integration of both recirculating aquaculture system (RAS) and hydroponic systems [1,2] and Internet of Things (IoTs) is a network constituted by uniquely identifiable commodity objects or devices equipped with some sensing system [3]. Using the IoTs platform [4] to build a smart control system for families mini Aquaponics garden provides an easy way for everyone to manage and control the farming garden without having to worry about the lack of sunlight, or the level of humidtity or temperature is not good enough [5].

All the activities of the aquaponics model will be able to be controlled in manual or automatic mode by a single smartphone app. This opens up a new future for home gardening, where everyone could help provide their own family needs of clean and one hundred percent organic vegetables and fishes with ease.

In this work, the circuit design principles of an IoT integrated control system can be applied for the monitoring and controlling the operation of a small-scale Aquaponic in house garden using basics electronic components and integrated circuit (IC).

Keywords : Aquaponics, family garden, control circuit, IoTs, integrated circuit (IC).

BIOGRAPHY: Prof. Nguyen Van HIEU

Nguyen Van Hieu, Ph.D, Associate Professor Head, Department of Physics and Electronics Engineering Faculty of Physics and Engineering Physics University of Science, Hochiminh City, Vietnam Email: nvhieu@hcmus.edu.vn and nvhieuosaka@yahoo.com
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Dr. Nguyen Van Hieu received his bachelor and master degree in Ho Chi Minh City University, Vietnam in 1994 and 2000. He obtained his PhD in Physics from the Graduate School of Science, Osaka University (Japan, 2007). In 2010, he was invited as visiting professor for the project of UVLED by Ritsumeikan University, Japan. He was also invited as researcher for the Lab of Semiconducting technology (Saigon Hi-Tech Park, since 2011). From Dec 2008 to Sep 2010, he served as Dean of Faculty of Electronics and Telecommunications. He was appointed an associate professor in 2011. He was a vice-chair of the National Development Microelectronics program in Ho Chi Minh (2012-2014). From April to June, 2017, prof. Hieu had the lectures and joint research works as an inviting research professor in Sophia University, Tokyo, Japan.
Now, he is head of the Department of Physics and Electronic Engineering, and Head of the Office of International Relations Projects Management. The join research work with Chonbuk National University- Korea, Dr. Hieu was appointed as a director of Research Center for Hi-tech Application in Agriculture (RCHAA) in VNU campus since Sep 2016.
Since 2007, Dr. Hieu already published around 30 international papers and 30 proceeding in workshop and domestic conferences. He was also publication 4 books for study, a principal researcher of 8 research projects (with 1 key national project) with many scientific awards. He was a supervisors of more than 40 master and PhD student in many universities,….
He was also invited talk in ASPA2013 (in SHTP, Vietnam), 4S international Conference 2010, 2012 (10 th anniversary of SHTP), SHTP Annual Conference2014, The 41st Congress on Science and Technology of Thailand (STT41), SHTP Annual Conference2016. member of Scientific council of Saigon Hi-Tech Park

Invited talk 1.3:

Title: **Hydrogen generation of Photocatalytic reaction**

Speaker: Vu Thi Hanh THU

Dept.of Applied Physics, Faculty of P&EP, VNUHCM-US, HCM City, Vietnam

Abstract:

In our research, nanostructured materials based on TiO_2 and ZnO have been chosen for water splitting to hydrogen generation and SERS applications, respectively. In this article, our recent research findings are introduced Cu_2O/TiO_2 nanotubes based composites for hydrogen evolution under sunlight, and Ag@ZnO hierarchical nanorod arrays as a pathway for highly reproducible surface-enhanced Raman spectroscopy applications.

BIOGRAPHY: Prof. Vu Thu Hanh THU

Dr. Vu Thu Hanh THU got bachelor (in 2001) and master (2005) and PhD degree (2009) in Faculty of Physcis Engineeing Physics, University of Science (VNUHCM).

Now, Prof. THU is senir lecturer in Dept.of Applied Physics. She obtained many scientific Achievement in educations, research and applications activies in recent years.

List all the research grants/ projects received the last 5 years.

1. Fabrication on (ZnO:Al)/c-Si solar cell The University of Science,

HCMC 2004-2005;

2. Set up the measurement systems for solar cells The University of Science,

HCMC 2005-2006;

3. The study on TiO2 photocatalytic thin film The University of Science,

HCMC 2006-2007;

4. The band gap dependence of the crystal structure of TiOxNy thin film The University of Science,HCMC 2007-2008;

5. Studying on TiO2 và TiO2-xNx/TiOxNy photocatalytic thin film by

unbalance magnetron sputtering; Department of Science andTechnology of Ho Chi Minh City; 2008-2010 ;

6. The study on TiOxNy photocatalytic thin film in visible light The University of Science,HCMC 2008-2009;

7. The study on Auger neutralization in DC magnetron sputtering with metal

Target, The national universty of HCMC 2009-2011;

Session 2.

Chair: **Dr. Nguyen Chi NHAN**
Dept.of Physics and Electronic Engineering, Faculty of Physics and Engineering Physics, VNUHCM-US

Room: F.102, Building F

Time	*Name of Invited Talks*
15:40-16:00	**Invited talk 2.1:** Prof. **Le Vu Tuan HUNG** VNUHCM-University of Science, Vietnam Title: Fabrication surface enhanced Raman scattering-SERS based on structure of nano Silver and Gold nano decorated on ZnO nanorods for detecting residual pesticide
16:00-16:20	**Invited talk 2.2:** Prof. Hoang TRANG Faculty of Electrical and Electronic Engineering, VNUHCM-University of Technology (VNUHCM-UT) Title: The Simulation Study of Process Variation on Threshold Voltage in 180nm Floating-Gate device
16:20-16:40	**Invited talk 2.3:** Prof. Nguyen Van Toan Mechanical Systems and Design, Tohoku University, Sendai, Japan Title: Metal-Assisted Chemical Etching Method Subjected to Micro/Nano Device Systems
16:40-16:50	**Conclusions and Remarks:** Prof. Takahito ONO

Invited talk 2.1:

Title**: Fabrication surface enhanced Raman scattering-SERS based on structure of nano Silver and Gold nano decorated on ZnO nanorods for detecting residual pesticide**

Speaker: Le Vu Tuan HUNG

Dept.of Applied Physics, Faculty of P&EP, VNUHCM-US, HCM City, Vietnam

Abstract:

In this study, we fabricated SERS substrate based on nano Ag and Au -decorated ZnO nanorod (NRs) array. Firstly, we synthesized ZnO NRs by sol-gel method and wet chemical method, then proceeded to modify Au nano particles on ZnO NRs by photo deposition method and Ag thin films on ZnO NRs by DC magnetron sputtering method. The effect of seed layer thickness on the growth of ZnO NRs was determined. Then we investigated the effect of different film thickness of Ag and Au to obtain the optimal Raman intensity. The SERS substrate gives an analytical enhancement factor (EF) more than $10^{6} - 10^{7}$ and could detect Rhodamine 6G (R6G) at concentrations less than 10^{-8} M, and Abamectin concentration at 100 ppm.

Keywords: SERS, The enhancement factor, ZnO NRs, Ag thin film, Rhodamine 6G, Abamectin

BIOGRAPHY: Prof. Le Vu Tuan HUNG

1.Research Areas:
Nano materials for optoelectrical devices and photocatalyst
2.Faculty/Department/Laboratory/Office
Applied Physics Department – Physics & Engineering Faculty
3. Research Activities
- Studying TiO2 doped and hetero-junction for photocatalysis in visible region (TiO2:(V,N); TiO2:(Cr,N)/MoS2), ZnO, SnO2 for photocatalysis.
- Studying MoS2. MoSe for photocatalyst and optoelectrical devices
- Studying CZTS and Cu2O thin film for high absorption layer p type semiconductor.
- Studying ZnO nanorod/Ag and Au nano particles for SERS.

4. Research Achievements and Awards: Project manager, 5 research projects (2005-2018)
5. Education Fields
- Optics & spectroscopy
- Nano materials

6. ISI Selected Publications:
1. Phung Nguyen Thai Hang, Truong Duc Nguyen, Duong Ai Phuong, Le Vu Tuan Hung.
Enhancement of the visible light photocatalytic activity of vanadium and nitrogen co-doped TiO2 thin film.
Journal of Nonlinear Optical Physics & Materials.V.24, issue.4 (2015).
2. Kieu Loan Phan Thi, Lam Thanh Nguyen, Dao Anh Tuan, Nguyen Huu Ke, Le Vu Tuan Hung.
Fabrication and characterization of n-ZnO nanorods/p-Si (100) heterojunction
Journal of Nonlinear Optical Physics & Materials.V.24, issue.4 (2015).
3. Nguyen Huu Ke1*, Le Thi Tuyet Trinh, Pham Kim Phung, Phan Thi Kieu Loan1, Dao Anh Tuan1,Nguyen Huu Truong, Cao Vinh Tran, and Le Vu Tuan Hung Changing the thickness of two layers: i-ZnO nanorods, p-Cu2O and its influence on the carriers transport mechanism of the p-Cu2O/i-ZnO nanorods/n-IGZO heterojunction. SpringerPlus (2016) 5:710
4. Nguyen Huu Ke, Le Thi Tuyet Trinh, Nguyen Thi Mung, Phan Thi Kieu Loan, Dao Anh Tuan, Nguyen Huu Truong, Cao Vinh Tran, Le Vu Tuan Hung,
Control of ZnO nanarod defects to enhance carrier transportation in p-Cu2O/i-ZnO nanorods/n-IGZO heterojunction, Journal of Nanoscience and Nanotechnology, (2016).
5. Nguyen Huu Ke, Nguyen Le Dang Khoa, Phan Thi Kieu Loan, Dao Anh Tuan, Le Huu Phuoc, Cao Vinh Tran , Le Vu Tuan Hung - The Characteristics of Cu2O:Na thin films prepared by DC Magnetron Sputtering method at low temperature. Volume 18, Number 10, October 2018, pp. 7170-7176(7)
6.Phan Thi Kieu Loan , Dao Anh Tuan, Nguyen Huu Ke, Le Vu Tuan Hung

Effect of thickness and sulfur-free annealing atmosphere on the structural, optical and electrical properties of Cu2ZnSnS4 thin films prepared by dip-
coating technique. Journal of Sol-Gel Science and Technology, (2017) doi:10.1007/s10971-017-4417-9.
7. Phung Nguyen Thai Hang, Nguyen Tran Khanh Van, Truong Duc Nguyen, Duong Ai Phuong, Le Vu Tuan Hung
Effect of co-doping and tri-doping with transition metals and a nonmetal on photocatalytic activity in visible light of TiO2 thin film, Journal of Korean Physical Sociaty, V.70 N.11 (15/6/2017)
8. Hang Phung, Van Khanh Nguyen Tran, Loan Thi Kieu Phan, Lam Thanh Nguyen, Ai Phuong Duong and Vu Tuan Hung Le
Investigating Visible-Photocatalytic Activity Of Mos2/Tio2 Heterostructure Thin Films At Various Mos2 Deposition Time, Journal of Nanomaterials. V6/2017
9. Nguyen Huu ke, Phan Thi Kieu Loan, Dao Anh Tuan, Tran Cao Vinh, Le Vu Tuan Hung.
The characteristics of IGZO/ZnO/Cu2O:Na thin film solarcells fabricated by DC Magnetron sputtering method.
Journal of Photochemistry and Photobiology A: Chemistry, V349 - 2017.
10. Phung Nguyen Thai Hang,Nguyen Duc Nguyen, Le Vu Tuan Hung.
Influence of MoS2 deposition time on the photocatalytic activity of MoS2/ V, N co-doped TiO2 heterostructure thin film in the visible light region.
Current Applied Physics. 18 (2018), 737-743
11. Anh Tuan Dao, Nguyen Huu Ke*, Phan Thi Kieu Loan, Le Vu Tuan Hung.
A Method To Improve Crystal Quality Of CZTSSe Absorber Layer
Journal of Sol-Gel Science and Technology, 1-9
12. Kieu Loan Phan Thi, Nguyen Thanh Lam, Dao Anh Tuan, Nguyen Huu Ke, Thi Quynh Anh Le, Le Vu Tuan Hung
The Morphology and Optical Properties of ZnO Nanorods Grown on MoS2 Thin Films at Various Thicknesses Using a Chemical Bath Deposition Method.
Journal of ELECTRONIC MATERIALS - The Minerals, Metals & Materials Society. 2018
13. Kieu Loan Phan Thi, Dao Anh Tuan, Nguyen Huu Ke, Thi Quynh Anh Le, Le Vu Tuan Hung
Effect of thickness and sulfur-free annealing atmosphere on the structural, optical and electrical properties of Cu2ZnSnS4 thin films prepared by dip-coating technique, Journal of Sol-Gel Science and Technology, 83(2), 324-331.
14. Doanh Tu Tieu, Ton Nu Quynh Trang, Le Vu Tuan Hung, Vu Thi Hanh Thu
Assembly engineering of Ag@ZnO hierarchical nanorod arrays as a pathway for highly reproducible surface-enhanced Raman spectroscopy applications
Journal of Alloys and Compounds, Accepted Date: 6 August 2019.

Invited talk 2.2:

Title**: The Simulation Study of Process Variation on Threshold Voltage in 180nm Floating-Gate device**

Speaker: Hoang TRANG

Faculty of Electrical and Electronic Engineering, VNUHCM-University of Technology (VNUHCM-UT)

Abstract:

The floating-gate device has become an established component of all electronic systems, especially Non-volatile memories in recent years. In this paper, the impact of process variation on the threshold voltage of a 180nm floating-gate device is presented. By using Athena, Atlas and Devedit 3D tools for 2D and 3D structure simulations, the study illustrates the sensitivity of the threshold voltage to different geometrical parameters including gate length, gate width, tunnel oxide thickness, nitride spacer thickness, and bottom ONO oxide thickness.

Keywords:

Floating-gate device; Non-volatile memory; Channel Hot Electron Injection; Fowler Nordheim Tunnel; CMOS Process; Process variation; TCAD

BIOGRAPHY: Prof. Hoang TRANG

- 2013-2015- Now. Lecturer,Head, Department of Electronics, Faculty of Electrical and Electronic Engineering, VNUHCM-University of Technology (VNUHCM-UT).
- 2015. Vice dean, Faculty of Electrical and Electronic Engineering, VNUHCM-UT.
- Nov 2018- Now. Senior lecturer, professor, Department of Electronics, Faculty of Electrical and Electronic Engineering. Head, Office of Graduate Studies, VNUHCM-UT.

Invited talk 2.3:

Title**: Metal-Assisted Chemical Etching Method Subjected to Micro/Nano Device Systems.**

Speaker: Nguyen Van TOAN

Mechanical Systems and Design, Tohoku University, Sendai, Japan

Abstract:

This work reports our recent investigations on the metal-assisted chemical etching (MACE) technique along with applying for micro/nano systems. To exemplify this technique, we investigated on the fabrications of different nano-microelectromechanical systems (NEMS/MEMS) devices; from simple structures to a complex structure. Contents of presentation are listed, as following.

- Ultra-high aspect ratio silicon structures produced vias MACE and assembly technology for cantilever fabrication [1]
- Cantilever with high aspect ratio nano pillars on its surface for moisture detection in electronic products [2]
- Ion transportation by gating voltage to nanopores produced via MACE [3]
- Capacitive silicon resonator with narrow gap formed by MACE [4]

Reference

[1] N.V. Toan, M. Toda, and T. Ono, *Transactions on Nanotechnology*, 16, 567-573, 2017.
[2] N.V. Toan, M. Toda, T. Hokama, and T. Ono, *Advanced Engineering Materials*, 19, 17003, 2017.
[3] N.V. Toan, N. Inomata, M. Toda, and T. Ono, *Nanotechnology*, 29, 195301, 2018.
[4] N.V. Toan, W. Xiaoyue, N. Inomata, M. Toda, I. Voiculescu, and T. Ono, *Advanced Engineering Materials*, 2019, 1900490, 2019.

BIOGRAPHY: Prof. Nguyen Van TOAN

Nguyen Van Toan received his B.S. degree in 2006 and his M.S. degree in 2009 in physics and electronics, respectively, from University of Science, Vietnam National University, Ho Chi Minh City, Viet Nam. He received his Dr. Eng. degree from Tohoku University in 2014 for research on silicon capable of integrating LSI for application to timing devices. He is working as an assistant professor in the Department of Mechanical Engineering, Graduate School of Engineering at Tohoku University. He has published over 40 journal papers, 1 book, 3 book chapters. His current research interests include capacitive silicon resonators, optical modulator devices, capacitive micromachined ultrasonic transducers, thermal electric power generators, Knudsen pump, ion transportation, energy harvester, and metal-assisted chemical etching.

Poster Presentation 1:

Title**: Heat Storage Thermoelectric Generator**

Authors: Truong Thi Kim Tuoi[1,*], Nguyen Van Toan[2] and Takahito Ono[1,2]

[1]Department of Mechanical Systems Engineering, Tohoku University, Sendai, JAPAN

[2]Micro System Integration Center, Tohoku University, Sendai, JAPAN

[*]Email: ttktuoi@nme.mech.tohoku.ac.jp

Abstract:

This work reports the theoretical modeling and experimental validation of a thermoelectric generator (TEG) integrated with a phase change material (PCM) (a heat storage unit) as an electrical power source for an IoT sensing system. PCM is capable of storing and releasing a large amount of heat which can create an internal spatial temperature difference from transient temperature variation. The proposed system is exposed to an ambient environment to absorb or release thermal energy to create a temperature difference on the both sides of the TEG. When the environmental temperature varies, heat flows in and out of the heat storage unit, which creates a temperature difference on the surface of TEG, thus resulting in generation of electrical power generation. This propsal shows a great potential to open a new era of IoT sensing systems using the thermoelectric power generators which harvest energy from ambient temperature environments.