

PROCEEDING



**2022 IEEE INTERNATIONAL
CONFERENCE ON
SEMICONDUCTOR ELECTRONICS**

15-17 AUGUST 2022 KUALA LUMPUR

VIRTUAL CONFERENCE



Organized by :



IEEE Catalog Numbers
USB Part Number: CFP22421-USB
ISBN: 978-1-6654-8245-5

© 2022 IEEE. Personal use of this material is permitted. However, permission to reprint/republish this material advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the IEEE.

PUBLICATION CONTACT

AHM Zahirul Alam
Faculty of Engineering
International Islamic University Malaysia
Jalan Gombak, 53100 Kuala Lumpur
Malaysia
Tel: +6 03 6421 4529
Email: zahirulalam@iium.edu.my
web: <https://zahirulalam.staffat.iium.edu.my/>

COPYRIGHT

Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved.

Copyright and Reprint Permissions:

Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For reprint or republication permission, email to IEEE Copyrights Manager at pubs-permissions@ieee.org. All rights reserved. Copyright ©2022 by IEEE.

IEEE Catalog Number
USB Part Number: CFP22421-USB
ISBN : 978-1-6654-8245-5

Additional Resources

IEEE Conference Operations
445 Hoes Lane
Piscataway, NJ 08854-4150 USA
Fax: +1 732 981 1769
Email: ieee-mce@ieee.org

© 2022 IEEE. *Personal use of this material is permitted. However, permission to reprint/republish this material advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the IEEE.*

IEEE Catalog Number CFP22421-USB
ISBN 978-1-6654-8245-5

Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved.

TABLE OF CONTENTS

Chair message	v
Organizing Committee	vi
List of Reviewers	vii
Keynote 1: Democratized Wearable Electronics Using DIY Assembly of Paper and High Performance CMOS Electronics	ix
<i>Prof. Dr. Lung-Chien Chen</i>	
Keynote 2: Contribution of excited states of molecular nitrogen to surface reactions in nitrogen plasmas	x
<i>Prof. Dr. Koichi Sasaki</i>	
Keynote3: Plasmonics in Biosensors and Electronic Devices	xi
<i>Assoc. Prof. Dr. P. Suthitha Menon</i>	
Simulation an Electrical Performance of Aluminium Nitride using Different Material Properties	1
<i>Norhafizah Burham; Anees Abdul Aziz; Norhazlin Khairudin; Ainul Basyirah Naseruddin</i>	
Modeling of The Effective Mobility of ZnO Nanowires: Diameter and Temperature Dependence	5
<i>Uddrity Mansur; Shumiya Alam; Farseem Mohammedy</i>	
Hydrogen Gas On Carbon-Doped Boron Nitride Nanoribbon Performance	9
<i>Ainun Khairiyah Taib; Zaharah Johari; Shaharin Fadzli Bin Abd Rahman; Mohd Fairus Mohd Yusof; Afiq Hamzah</i>	
The effect of pH level and annealing temperature on NiO thin films as Hole Transport Material in Inverted Perovskite Solar Cells	13
<i>Subathra Muniandy; Muhammad Idzdihar Bin Idris; Zul Atfyi Fauzan Mohammed Napiyah; Marzaini Rashid</i>	
Performance Analysis of Junctionless Multi-Bridge Channel FET with Strained SiGe Application	17
<i>Syafizah Afidah Affandi; Nurul Ezaila Alias; Afiq Hamzah; Michael Loong Peng Tan; Hanim Hussin</i>	
Modelling of Thin-film Transistor for Glucose Sensing Application	21
<i>Sharifah Fatmadiana Wan Muhamad Hatta; Norhayati Soin; Fazliyatul Azwa Md Rezali</i>	
Ultra-Sensitive Flexible Piezoresistive Strain Sensor Simulation using Carbon Nanotube Composite	25
<i>Sharifah Fatmadiana Wan Muhamad Hatta; Norhayati Soin; Yasmin Abdul Wahab; Syed Muzamil Ahmed</i>	
Study of adsorption isotherms in the detection of acetone and isopropyl alcohol using QCM sensor with chitosan sensing layer	29
<i>Nurul Liyana binti Lukman Hekiem; Aliza Aini Md Ralib; Farah B. Ahmad; Maziati Akmal Mohd Hatta; Nor Farahidah Za'bah</i>	
Electrical Performance of Single Thermocouple With Different Types of Materials Using Multiphysics Simulation	33
<i>Anees Abdul Aziz; Norhafizah Burham; Siti Fadzillah Nurain; Maizan Muhamad</i>	
Electrochemistry of Green Ag Nanoparticles Modified Electrode Surface	37
<i>Yasmin Abdul Wahab; Mohammad Al Mamun; M. A. Motalib Hossain; Md. Kamrul Alam Khan; Abu Hashem; Mohd Rafie Johan; Hanim Hussin; Nurul Ezaila Alias</i>	

The effects of Fluorine implantation and ex-situ Nitrogen anneal on Reliability improvement of 5V CMOSFETs	41
<i>Hun Jin Lee; Steven John Pilkington; Steve Knebel; Chee Meng Loi; Hui Choo Voon; Michaelina Ong</i>	
Investigating the capacitive properties of all-inorganic lead halides perovskite solar cells using energy band diagrams	45
<i>Sameh Osama; Zahraa Ismail; Eman Sawires; Fathy Amer</i>	
Micro Accelerometer Built-In Self-Test and Calibration Using Genetic Algorithm and Interpolation Method	49
<i>Anwer Sabah Ahmed</i>	
Design and Simulation of Band 40 RF SAW ladder-type filter	53
<i>Aditya R Devaskar; Vanita Agarwal; Vinay Kulkarni</i>	
Design And Simulation of 2D Zinc Oxide Based SAW Gas Sensor for Hydrogen Gas Sensing	57
<i>Adib Mohammad; Suhana Mohamed Sultan; Michael Loong Peng Tan</i>	
Enhancement of Film Uniformity by Controlling Solution Viscosity on Fabrication of Silsesquioxane Thin Films	61
<i>Mat Tamizi Zainuddin; Farinaa Md Jamil; Syazana Abu Bakar; Nurazilah Mohd Zainon; Nor Shahida Kader Basha; Siti Mariam Mohamad</i>	
Ultra low Rdson LDMOS with 12V BVDSS	65
<i>Brendan Toner; Hafizah Abdul Malik; Darin Davis; Terry Johnson; William Richards; Gary Dolny</i>	
A March 5n FSM-Based Memory Built-In Self-Test (MBIST) Architecture with Diagnosis Capabilities	69
<i>Kok Heng Ng; Nurul Ezaila Alias; Afiq Hamzah; Michael Loong Peng Tan; Usman Ullah Sheikh; Yasmin Abdul Wahab</i>	
Comprehensive Analysis of Gate Oxide Short in Junctionless Fin Field Effect Transistor	73
<i>Md Wahidur Rahman; Nurul Ezaila Alias; Afiq Hamzah; Michael Loong Peng Tan; Izam Kamisian</i>	
Dark Current Suppression in MoS₂/h-BN/Graphene Photodetector for Self-Powering Applications	77
<i>Umahwathy Sundararaju; Muhammad Aniq Shazni Mohammad Haniff; P. Susthitha Menon</i>	
Ascorbic Acid Detection Using Spectrometer and Deuterium and Halogen Light Source	81
<i>Nur Nadia Bachok; Norhafizah Burham; Norhana Arsad; Ahmad Ashrif A. Bakar; Nurul Huda Abd Karim; Ahmad Razi Othman</i>	
Study of tapered multimode optical fibre performance for salinity detection	85
<i>Norhafizah Burham; Norazida Ali; Nur Nadia Bachok; Norhana Arsad</i>	
Power Management Circuit for Semi-Passive UHF RFID Transponder	89
<i>Yean Sun Yong; Faisal Mohd-Yasin</i>	
Reduced March SR Algorithm for Deep-Submicron SRAM Testing	93
<i>Aiman Zakwan Jidin; Razaidi Hussin; Mohd Syafiq Mispan; Weng Fook Lee; Wan Ying Loh</i>	
A Capacitorless Multi-Voltage Domain Low Dropout Regulator with 400 mA Load Current for Embedded System Application	97
<i>Balamahesn Poongan; Jagadheswaran Rajendran; Selvakumar Mariappan; Pravinah Shasidharan; Arokia Nathan</i>	

Hardware Design of Combinational 128-bit Camellia Symmetric Cipher using 0.18μm Technology	101
<i>Chawalit Udom sak; Siti Zarina Md Naziri; Rizalafande Che Ismail; Mohd. Nazrin Md Isa; Razaidi Hussin</i>	
Majority Logic Based In-Memory Comparator	105
<i>D Vijaya Lakshmi; John Reuben; Vikram Kumar Pudi</i>	
Design of Low Power PMOS Biased Sense Amplifier Using LECTOR Approach	109
<i>Harshit Verma</i>	
A PVT invariant cascode current reference circuit in 180nm CMOS process	113
<i>Payavula Swathi; Bhaskar Manickam</i>	
Levenberg-Marquardt Backpropagation model augmented with Prim's algorithm approach (LMBP) to minimize power in FSM synthesis	117
<i>Kaushik Khatua</i>	
Investigation of Hybrid Graphene-hBN and Graphene-GO as a Direct Contact Heat Spreader	121
<i>Nur Julia Nazim Bulya Nazim; Mohd Faizol Abdullah; Mohd Rofei Mat Hussin; Siti Aishah Mohamad Badaruddin; Muhamad Amri Ismail; Abd Manaf Hasyim</i>	
Thermal Characterization of Mono and Multilayer Hexagonal Boron Nitride Heat Spreaders	125
<i>Nur Julia Nazim Bulya Nazim; Mohd Faizol Abdullah; Mohd Rofei Mat Hussin; Siti Aishah Mohamad Badaruddin; Muhamad Amri Ismail; Abd Manaf Hasyim</i>	
One-Step Synthesis of Nanostar Shaped Silver Nanoparticles and its Optical Stability	129
<i>Azib Haiman Roslan; Siti Rabizah Makhsin; Khairunisak Abdul Razak; Rozina Abdul Rani; Muhammed Zourob</i>	
Investigating Defect-Assisted Emission in BaSi₂ by Power Dependent Photoluminescence	133
<i>Abdul Rahman Mohmad; Zhihao Xu; Yudai Yamashita; Takashi Suemasu</i>	
Determination of CuO Concentration for ZNR/P3HT/CuO as the Potential Thin Film in Solar Cell Application	136
<i>Rohanieza Abdul Rahman; Muhammad AlHadi Zulkefle; Rosalena Irma Alip; Sukreen Hana Herman</i>	
Annealing Effect On Ultraviolet Sensor Performance With Porous Silicon Based	140
<i>Muhammad Zuhdi Mohd Yusoff; Rozina Abdul Rani; Irnie Azlin Zakaria; Siti Rabizah Makhsin; Ahmad Sabirin Zoolfakar; Zainah Md Zain; Nur Lili Suraya Ngadiman</i>	
Die-Level Defects Classification using Region-based Convolutional Neural Network	144
<i>Usman Ullah Sheikh Izzat Ullah Sheik; Kwong You; Nurul Ezaila Alias</i>	
Machine Learning Facemask Detection Models For Covid-19	148
<i>Anwar Ahmad Zainuddin; Muhammad Maaz; Rohilah Sahak; Muhammad Farhan Affendi Mohamad Yunos; Siti Husna Abdul Rahman; Munirah Mohd Ramly; Wonderful Shammah Kaitane; Asmarani Ahmad Puzi</i>	
Analysis and Design of an Efficient and Wideband Common Collector Class B Amplifier for Auxiliary Envelope Tracking Supply Modulator	152
<i>Zubaida Yusoff; Md Mushfiqur Rahman; Mardeni Roslee; Shaiful Hashim; Azah Syafiah Mohd Marzuki</i>	
A Mixer-First Receiver Frontend with Dual-Feedback Baseband Achieving >300 MHz IF Bandwidth in 65 nm CMOS	156
<i>Benqing Guo; Runwu Fan; Huifen Wang; Haishi Wang</i>	

A Novel Single-Band Slotted Octagonal Microstrip Patch Antenna For 5G Communications <i>Saida Sharmin</i>	160
Analysis and Design of Safety Perambulator System via Wi-Fi and Blynk Application <i>Muhammad Syamil Muttaqin Zulkifli; Ahmad Sabirin Zoolfakar; Rozina Abdul Rani; Azrif Manut; Maizatul Zolkapli; Muhammad Haziq Bin Ilias; Norhazlin Khairudin; Katrul Nadia Basri</i>	163
Author Index	167

MESSAGE FROM THE CHAIRMAN



Assoc. Prof. Ir. Ts. Dr. Ahmad Sabirin Zoolfakar

Assalamualaikum warahmatullahi wabarakatuh,

On behalf of the ICSE 2022 organizing committee, I am honored and delighted to welcome you to the virtual 2022 IEEE International Conference on Semiconductor Electronics (ICSE). The 2022 IEEE International Conference on Semiconductor Electronics committee have worked hard these past few months to ensure that we bring you the IEEE ICSE 2022 in a safe and accessible platform.

This is the 15th ICSE organized by the **Electron Devices Chapter of IEEE Malaysia Section** and technically co-sponsored by the **IEEE Electron Devices Society Malaysia Chapter**. Over the last twenty-eight years, the ICSE conference series has become the prominent international forum on semiconductor electronics embracing all aspects of the semiconductor technology from circuit device, modelling and simulation, photonics and sensor technology, MEMS technology, process and fabrication, packaging technology and manufacturing, failure analysis and reliability, material, and devices and nanoelectronics.

On behalf of the organizing committee, we thank you for your active participation in ICSE 2022. Your strong continuous support in selecting ICSE 2022 as the platform to publish your latest research in semiconductor electronics is greatly appreciated. During the 3-day conference, 42 oral presentations will be delivered across a broad spectrum of technical sessions. These include three keynote speakers which are Prof. Koichi Sasaki (Hokkaido University), Prof. Lung-Chien Chen (National Taipei University of Technology) and Assoc. Prof. Dr. P. Suthitha Menon (Universiti Kebangsaan Malaysia)

I would like to express my gratitude to the participants, members of the organizing committee, secretarial staff, and everyone who have worked hard to make this conference into reality. Finally, I hope that ICSE 2022 will be successful and enjoyable to all participants.

Thank you and Terima kasih.

Assoc. Prof. Ir. Dr. Ahmad Sabirin Zoolfakar
Chairman
2022 IEEE International Conference on Semiconductor Electronics (ICSE)
2021 & 2022 IEEE EDS Malaysia Chapter

ORGANIZING COMMITTEE

Advisor: Prof. Dato' Dr. Burhanuddin Yeop Majlis
Prof. Ir. Dr. Norhayati Soin

Chair: Assoc. Prof. Ir. Ts. Dr. Ahmad Sabirin Zoolfakar

Co-Chair: Prof. Dr. AHM Zahirul Alam

Technical Chair: Ts. Dr. Nurul Ezaila Alias
Dr. Yasmin Abdul Wahab

Secretary: Ir. Ts. Dr. Maizatul Zolkapli

Treasurer: Ir. Dr. Hazian Mamat

Publicity Chair & Webmaster: Dr. Aliza Aini Md Ralib,
Assoc. Prof. Dr. Rosminazuin Ab Rahim

Secretariat Committee

Leader: Dr. Sharifah Fatmadiana Wan Muhammad Hatta

Member:

Ir. Ts. Dr. Hanim Hussin
Ir. Ts. Dr. Maizan Muhamad
Ir. Dr. Azrif Manut
Dr. Iskandar Yahya
Ts. Dr. Suhana Mohamed Sultan
Dr. Hasnizah Aris

COMMITTEE MEMBERS

Assoc. Prof. Dr. Badariah Bais (MQ)
Assoc. Prof. Dr. P Susthitha Menon (MQ)
Prof. Dr. Mohd Nizar Hamidon

LIST OF REVIEWERS

Name	Affiliation	Country
Afiq Nurudin Hamzah	Universiti Teknologi Malaysia	Malaysia
AHM Zahirul Alam	International Islamic University Malaysia	Malaysia
Ahmad Alabqari Ma' Radzi	Universiti Tun Hussein Onn Malaysia	Malaysia
Ahmad Sabirin Zoolfakar	Universiti Teknologi MARA	Malaysia
Aliza Aini Md Ralib	International Islamic University Malaysia	Malaysia
Azli Yahya	Universiti Teknologi Malaysia	Malaysia
Azrif Manut	Universiti Teknologi MARA	Malaysia
Badariah Bais	Universiti Kebangsaan Malaysia	Malaysia
Badrul Hisham Ahmad	Universiti Teknikal Malaysia Melaka	Malaysia
Chutisant Kerdvibulvech	National Institute of Development Administration	Thailand
Dan Ciulin	E-I-A	Switzerland
Datta Chavan	Bharati Vidyapeeth Deemed University College of Engineering, Pune	India
David Forsyth	UTM	United Kingdom
Duu Sheng Ong	Multimedia University	Malaysia
EDS Malaysia Malaysia	Universiti Kebangsaan Malaysia	Malaysia
Eduard Babulak	Liberty University	USA
Faizah Abu Bakar	Universiti Malaysia Perlis	Malaysia
Hanim Hussin	Universiti Teknologi MARA	Malaysia
Hasnizah Aris	Universiti Malaysia Perlis (UniMAP)	Malaysia
Hing Keung Lau	Hong Kong Institute of Vocational Education	Hong Kong
Ibrahim Ahmad	Universiti Tenaga Nasional	Malaysia
Ir. Hazian Bin Mamat	Mimos Berhad	Malaysia
Iskandar Yahya	Universiti Kebangsaan Malaysia	Malaysia
Iwan Adhicandra	University of Sydney	Australia
Jumril Yunas	Universiti Kebangsaan Malaysia	Malaysia
Li Wah Thong	Multimedia University	Malaysia
Maizatul Zolkapli	Universiti Teknologi MARA	Malaysia
Md. Akhtaruzzaman	Universiti Kebangsaan Malaysia	Malaysia
Mehmet Ertugrul	Ataturk University	Turkey
Mohammad Faiz Liew Abdullah	Universiti Tun Hussein Onn Malaysia (UTHM)	Malaysia
Mohd Tafir Mustaffa	Universiti Sains Malaysia	Malaysia
Muhammad Mokhzaini Azizan	Universiti Sains Islam Malaysia	Malaysia
Nadheer A. Shalash	Al-Mamoon University College	Iraq
Nafarizal Nayan	Universiti Tun Hussein Onn Malaysia	Malaysia
Noor Ain Kamsani	Universiti Putra Malaysia	Malaysia
Norhana Arsad	Universiti Kebangsaan Malaysia	Malaysia

LIST OF REVIEWERS

Name	Affiliation	Country
Norhayati Soin	University of Malaya	Malaysia
Nurul Ezaila Alias	Universiti Teknologi Malaysia	Malaysia
P. Suthitha Menon	Universiti Kebangsaan Malaysia	Malaysia
Puteri Sarah Mohamad Saad	Universiti Teknologi MARA	Malaysia
Rosminazuin Ab Rahim	International Islamic University Malaysia	Malaysia
S. M. A. Motakabber	International Islamic University Malaysia	Malaysia
Sergey B. Biryuchinskiy	Vigitek, Inc.	USA
Sew Sun Tiang	Universiti Sains Malaysia	Malaysia
Shaharin Fadzli Bin Abd Rahman	Universiti Teknologi Malaysia	Malaysia
Sharifah Fatmadiana Wan Muhamad Hatta	University of Malaya	Malaysia
Sharifah Md Yasin	Universiti Putra Malaysia	Malaysia
Suhaila Isaak	Universiti Teknologi Malaysia	Malaysia
Suhana Mohamed Sultan	Universiti Teknologi Malaysia	Malaysia
Thennarasan Sabapathy	University Malaysia Perlis	Malaysia
Usman Ullah Sheikh Izzat Ullah Sheik	Universiti Teknologi Malaysia	Malaysia
Wira Hidayat bin Mohd Saad	Universiti Teknikal Malaysia Melaka	Malaysia
Xiaoce Feng	Wayne State University	USA
Yaareb M.Basheer Ismael Al-Khashab	Ministry of Water Resources/Badush Dam	Iraq
Yasmin Abdul Wahab	University of Malaya	Malaysia
Zaharah Johari	Universiti Teknologi Malaysia	Malaysia

KEYNOTE 1

PROPERTIES AND SENSING APPLICATIONS OF MA₃Sb₂Br₉ BULK CRYSTALS AND (PEA)₂(MA)₃Sb₂Br₉ THIN FILMS

Prof. Lung-Chien Chen

Abstract: In this work, we report two kinds of detectors: one is a perovskite-like (CH₃NH₃)₃Sb₂Br₉ (MA₃Sb₂Br₉) MSM-type photodetectors; and, the other one is quasi 2-dimensional (PEA)₂(MA)₃Sb₂Br₉ transistor-type thin film alcohol detectors. The MA₃Sb₂Br₉ bulk visible photodetector is prepared by inverse temperature crystallization method and the quasi 2-dimensional (PEA)₂(MA)₃Sb₂Br₉ transistor-type thin film alcohol detector is prepared by spin coating method. Firstly, we have fabricated a photodetector based on MA₃Sb₂Br₉ perovskite-like single crystal due to the Sb-based perovskite is a material that are more stable in air and moisture than Pb-based perovskites. Here, MA₃Sb₂Br₉ single crystals were synthesized by inverse temperature crystallization process with precursor solution at three different growth temperatures. MA₃Sb₂Br₉ single crystal with an optimum growth temperature of 60 °C presents the best owing to excellent crystal structure and optical absorption properties. On the other hand, recently, we also have fabricated an alcohol detector based on the quasi 2-dimensional (Q2D) (PEA)₂(MA)₃Sb₂Br₉ transistor-type thin films. Here, MA₃Sb₂Br₉ films were spin-coated on the glass substrates with ITO pattern. X-ray diffraction (XRD) patterns, absorbance, and current-voltage were employed to examine the characterizations of the Q2D (PEA)₂(MA)₃Sb₂Br₉ films and devices. One diffraction peak at 30.2° corresponding to the cubic crystal (022) phase was observed. The position of absorption edges of MA₃Sb₂Br₉ and Q2D (PEA)₂(MA)₃Sb₂Br₉ film were around 518 and 500 nm, respectively. It is corresponding to the band gap of MA₃Sb₂Br₉ and Q2D (PEA)₂(MA)₃Sb₂Br₉. The MA₃Sb₂Br₉ and Q2D (PEA)₂(MA)₃Sb₂Br₉ perovskite-like alcohol detector exhibits high responsivity of 74 and 83 for 5 % of alcohol concentration, respectively. Besides, the rise time and fall time were 1.85 and 0.77 sec for alcohol detection, respectively.



Prof. Lung-Chien Chen received his Ph. D degree in the electrical engineering from the National Tsing Hua University, Hsinchu, Taiwan, in 1999. He has a professional career in industrial institution: Manager and Vice Assistance President in Formosa Epitaxy Photonic Incorporation (1999–2002). In 2002, he joined National Taipei University of Technology (Taipei Tech), Taiwan, as a faculty member of Department of Electro-Optical Engineering. Currently, he is a full Professor of Taipei Tech and his main research interests include compound semiconductor growth (GaSb, AlInGaP, III-nitrides, zinc oxide, and perovskites), material analysis, and device fabrication technology, light-emitting diodes (LEDs), photodetectors, and solar cells. He has authored or coauthored more than 160 journal papers and 5 books or book chapters. He is the holder of more than 21 patents

in his fields of expertise. Prof. Chen is the Optica (former of Optical Society of American (OSA)) Senior member and the IEEE Senior member. He was elected as the fellow of Royal Society of Chemistry (RSC) in 2019. In 2021, Prof. Chen is selected as the global top 2% of scientists by Elsevier. In 2022, the International Association of Advanced Materials nominated him for Advanced Materials Award.

KEYNOTE 2

CONTRIBUTION OF EXCITED STATES OF MOLECULAR NITROGEN TO SURFACE REACTIONS IN NITROGEN PLASMAS

Prof. Koichi Sasaki

Abstract: Nitrogen plasmas are utilized in surface nitriding of metallic and semiconductor materials. In addition, the synthesis of ammonia using nitrogen-hydrogen mixture plasmas becomes an active research topic in plasma science. The most important reactive species in nitrogen plasmas is believed to be atomic nitrogen, but in this talk, we will discuss the importance of molecular nitrogen at excited states. In many years ago, we compared the nitriding rates of Si [1] and SiC [2] in nitrogen plasmas with the densities of atomic nitrogen. The experimental results did not indicate the correlation, suggesting that the existence of more effective species for the surface nitriding. We also measured the density of molecular nitrogen at the electronic metastable state. As a result, we observed the better correlation between the nitriding rate and the density of the metastable state. Now, we are working on the synthesis of ammonia using nitrogen-hydrogen mixture plasmas. The synthesis of ammonia is a catalytic reaction, where the adsorption of nitrogen on the catalysis surface is the rate limiting step. We compared the synthesis rate of ammonia with the fluxes of atomic nitrogen and molecular nitrogen at vibrational excited states. The experimental results indicate the better correlation between the synthesis rate and the flux of vibrationally excited molecular nitrogen. We believe that we should consider the contribution of molecular nitrogen at excited states when we design surface reaction processes using nitrogen plasmas.

[1] Y. Horikawa, K. Kurihara, and K. Sasaki, Appl. Phys. Express 4, 086201 (2011).

[2] M. Shimabayashi, K. Kurihara, Y. Horikawa, and K. Sasaki, Jpn. J. Appl. Phys. 55, 036503 (2016).



Prof. Koichi Sasaki received PhD from Nagoya University in 1991. He is a full professor of Division of Quantum Science and Engineering, Graduate School of Engineering, Hokkaido University. Having an experience as Assistant Professor of Graduate School of Engineering, Nagoya University, Associate Professor of Graduate School of Engineering, Nagoya University and Associate Professor of Plasma Nanotechnology Research Center, Nagoya University.

Current engaged program:

- Editorial Board Member of Plasma Sources, Science and Technology
- Guest Editor of Journal of Physics D: Applied Physics, Special Issue “Plasma Diagnostics Based on Spectroscopic Methods”
- Executive Committee of Gaseous Electronics Conference
- Director Board Member of Japan Society of Plasma and Fusion Research
- Committee of International Tokamak Physics Activity (ITPA), Topical Group on Diagnostics
- Having more than 25 publications in the last 5 years

KEYNOTE 3

PLASMONICS IN BIOSENSORS AND ELECTRONIC DEVICES

Assoc. Prof. Dr. P. Susthitha Menon

Abstract: Plasmonics takes advantage of the coupling of light to charges like electrons in metals, and allows breaking the diffraction limit for the localization of light into subwavelength dimensions enabling strong field enhancements. This presentation will give an overview of the design and development of plasmonic biosensors utilizing the Kretschmann configuration with angular interrogation for detecting the presence of biomolecules. Methodology of this study was executed using Finite Difference Time Domain (FDTD) method and experimental characterization was executed using Bionavis Surface Plasmon Resonance (SPR) equipment. Kretschmann-based SPR sensor with 50 nm-thick gold film was used for glucose, urea and creatinine detection at 670 nm and 785 nm electromagnetic (EM) wavelengths. There will also be an overview on plasmonic applications in other biosensors, microring resonators, solar cells and photodiodes.



Assoc. Prof. Dr. P. Susthitha Menon is currently an Associate Professor at the Institute of Microengineering and Nanoelectronics (IMEN), Universiti Kebangsaan Malaysia (UKM). She received her BEng degree from UKM in 1999. As an Intel scholar, she worked at Intel Malaysia as a Product Engineer for mobile modules systems from 1999 to 2002. She then received her MSc and PhD (Distinction) degrees in 2005 and 2008 respectively from UKM, for the development of Si- and InGaAs-based interdigitated p-i-n photodiodes. At IMEN, she is specializing in the field of plasmonics, optoelectronics, nanophotonics, and robust engineering optimization. Dr Menon is a Senior Member of SPIE, OSA and IEEE since 2009. She is a member of IEEE Electron Devices Society (EDS) Board of Governors (BoG), the Vice Chair of the IEEE EDS R10 SRC committee and is the Past Chair of the IEEE EDS Malaysia Chapter 2017-2018 which during her tenure as Chair, won the IEEE EDS R10 Best Chapter Award in 2018 as well as the IEEE Malaysia Section's Best Chapter Award in 2017 and 2018 respectively. She also serves various functions in international conferences including EDTM and IFETC.

AUTHOR INDEX

Author	Page No	Author	Page No
A. Bakar, Ahmad Ashrif	81	Guo, Benqing	156
Abd Karim, Nurul Huda	81	Hamzah, Afiq	9 17 69 73
Abd Rahman, Shaharin Fadzli	9	Hashem, Abu	37
Abdul Aziz, Anees	1 33	Hashim, Shaiful	152
Abdul Malik, Hafizah	65	Hasyim, Abd Manaf	121 125
Abdul Rahman, Rohanieza	136	Herman, Sukreen Hana	136
Abdul Rahman, Siti	148	Hossain, M. A. Motalib	37
Abdul Rani, Rozina	129 140 163	Hussin, Hanim	17 37
Abdul Razak, Khairunisak	129	Hussin, Razaidi	93 101
Abdul Wahab, Yasmin	25 37 69	Idris, Muhammad Idzdihar	13
Abdullah, Mohd Faizol	121 125	Ilias, Muhammad Haziq	163
Abu Bakar, Syazana	61	Ismail, Muhamad Amri	121 125
Affandi, Syafizah Afidah	17	Ismail, Zahraa	45
Agarwal, Vanita	53	Izzat Ullah Sheik, Usman Ullah	144
Ahmad, Farah	29	Sheikh	
Ahmad Puzi, Asmarani	148	Jidin, Aiman Zakwan	93
Ahmed, Anwer	49	Johan, Mohd Rafie	37
Ahmed, Syed Muzamil	25	Johari, Zaharah	9
Al Mamun, Mohammad	37	Johnson, Terry	65
Alam, Shumiya	5	Kader Basha, Nor Shahida	61
Ali, Norazida	85	Kaitane, Wonderful	148
Alias, Nurul Ezaila	17 37 69 73 144	Kamisian, Izam	73
Alip, Rosalena Irma	136	Khairudin, Norhazlin	1 163
Amer, Fathy	45	Khan, Md. Kamrul	37
Arsad, Norhana	81 85	Khatua, Kaushik	117
Bachok, Nur Nadia	81 85	Knebel, Steve	41
Basri, Katrul Nadia	163	Kulkarni, Vinay	53
Bulya Nazim, Nur Julia Nazim	121 125	Lee, Hun Jin	41
Burham, Norhafizah	1 33 81 85	Lee, Weng	93
Che Ismail, Rizalafande	101	Loh, Wan Ying	93
Davis, Darin	65	Loi, Chee Meng	41
Devaskar, Aditya	53	Lukman Hekiem, Nurul Liyana	29
Dolny, Gary	65	binti	
Fan, Runwu	156	Maaz, Muhammad	148

Author	Page No	Author	Page No
Makhsin, Siti Rabizah	129 140	Muniandy, Subathra	13
Manickam, Bhaskar	113	Naseruddin, Ainul Batrisyah	1
Mansur, Uddrity	5	Nathan, Arokia	97
Manut, Azrif	163	Ng, Kok Heng	69
Mariappan, Selvakumar	97	Ngadiman, Nur Lili Suraya	140
Mat Hussin, Mohd Rofei	121 125	Nurain, Siti Fadzillah	33
Md Isa, Mohd. Nazrin	101	Ong, Michaelina	41
Md Jamil, Farinaa	61	Osama, Sameh	45
Md Naziri, Siti Zarina	101	Othman, Ahmad Razi	81
Md Ralib, Aliza Aini	29	Pilkington, Steven John	41
Md Rezali, Fazliyatul Azwa	21	Poongan, Balamahesn	97
Md Zain, Zainah	140	Pudi, Vikram Kumar	105
Menon, P. Susthitha	77	Rahman, Md Mushfiqur	152
Mispan, Mohd Syafiq	93	Rahman, Md Wahidur	73
Mohamad, Siti Mariam	61	Rajendran, Jagadheswaran	97
Mohamad Badaruddin, Siti Aishah	121 125	Rashid, Marzaini	13
Mohamad Yunos, Muhammad Farhan Affendi	148	Reuben, John	105
Mohamed Sultan, Suhana	57	Richards, William	65
Mohammad, Adib	57	Roslan, Azib	129
Mohammad Haniff,	77	Roslee, Mardeni	152
Muhammad Aniq Shazni		Sahak, Rohilah	148
Mohammed Napiah, Zul Atfyi Fauzan	13	Sawires, Eman	45
Mohammedy, Farseem	5	Sharmin, Saida	160
Mohd Hatta, Maziatl Akmal	29	Shasidharan, Pravinah	97
Mohd Marzuki, Azah Syafiah	152	Sheikh, Usman	69
Mohd Ramly, Munirah	148	Soin, Norhayati	21 25
Mohd Yusof, Mohd Fairus	9	Suemasu, Takashi	133
Mohd Yusoff, Muhammad Zuhdi	140	Sundararaju, Umahwathy	77
Mohd Zainon, Nurazilah	61	Swathi, Payavula	113
Mohd-Yasin, Faisal	89	Taib, Ainun	9
Mohmad, Abdul Rahman	133	Tan, Michael Loong Peng	17 57 69 73
Muhamad, Maizan	33	Toner, Brendan	65
		Udom sak, Chawalit	101
		Verma, Harshit	109
		Vijaya Lakshmi, D	105
		Voon, Hui Choo	41

Author	Page No
Wan Muhamad Hatta, Sharifah Fatmadiana	21 25
Wang, Haishi	156
Wang, Huifen	156
Xu, Zhihao	133
Yamashita, Yudai	133
Yong, Yean Sun	89
You, Kwong	144
Yusoff, Zubaida	152
Za'bah, Nor Farahidah	29
Zainuddin, Anwar	148
Zainuddin, Mat Tamizi	61
Zakaria, Irmie	140
Zolkapli, Maizatul	163
Zoolfakar, Ahmad Sabirin	140 163
Zourob, Muhammed	129
Zulkefle, Muhammad AlHadi	136
Zulkifli, Muhammad Syamil	163