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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/

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IEEE Conference Operations
445 Hoes Lane
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Fax: +1 732 981 1769
Email: ieee-mce@ieee.org

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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. Susthitha 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

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LIST OF REVIEWERS

Name	Affiliation	Country
Norhayati Soin	University of Malaya	Malaysia
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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 30.2o 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 rofessor 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 Governers (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.

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