2015 IEEE International Meeting for Future of Electron Devices, Kansai

(IMFEDK 2015)

Kyoto, Japan
4 – 5 June 2015

IEEE Catalog Number: CFP15567-POD
ISBN: 978-1-4799-8616-3

The Conference Theme

New functional devices for the next generation

Table of Contents

6/4 ....

Tutorials (in Japanese)

9:30-10:10 **Development history of blue light-emitting-diodes** N / A
Masafumi Hashimoto (Toyota Central R&D Labs.-Retired)

Short Break (10:10-10:30)

10:30-11:10 **Fundamentals and Applications of Microwave Technology** N / A
Toshio Ishizaki (Ryukoku University)

Opening

13:00-13:10 Opening Remarks by Yasuhisa Omura (Kansai University)

Keynote Speeches

13:10-13:50

K-1 **(p.18)** **III-V/Ge MOSFETs and Tunneling FETs on Si platform for Low Power Logic Applications** **2**
Shinichi Takagi and Mitsuru Takenaka (The University of Tokyo)

Short Break (13:50-14:00)

Session A (Compound Semiconductor Devices)

14:00-14:40 - Invited -
A-1 **(p.22)** **Nano-Channel InAlN/GaN Fin-HEMTs for Ultra- High-Speed Electronics** 5
Subramaniam Arulkumaran and Geok Ing Ng
(Nanyang Technological University)

14:40-15:00
A-2 **(p.24)** **Characteristics of Perovskite Solar Cells under Low Illuminance Condition** 7
Itaru Raifuku, Yasuaki Ishikawa and Yukiharu Uraoka (NAIST)

Short Break (15:00-15:10)

15:10-15:30
A-3 **(p.26)** **AlGaAs/InGaAs HEMTs Passivated with Atomic Layer Deposited SiO_2 using Aminosilane Precursors** 9
Takayuki Suzuki, Yosuke Takigawa, Naotaka Iwata, Dongyan Zhang and Yoshio Ohshita (Toyota Technological Institute)

15:30-15:50
A-4 **(p.28)** **Evaluation of band structure and conductive property of iron pyrite (FeS_2) thin film deposited by spin-coating** 11
Shunsuke Uchiyama, Yasuaki Ishikawa, Takahiro Doe and Yukiharu Uraoka (NAIST)

15:50-16:10
A-5 **(p.30)** **Terahertz Resonant Tunneling Diode Systems for Next Generation Wireless Communication** 13
Sebastian Diebold[1], Kazuisao Tsuruda[1,2], Jaeyoung Kim[2], Toshikazu Mukai[2], Masayuki Fujita[1] and Tadao Nagatsuma[1]
([1]Osaka University, [2]ROHM Co., Ltd.)

Short Break (16:10-16:20)

Poster Session

Short Presentation – 2min. each (6/4, 16:20-17:40)

PA-01 (p.34) **Simulation study of NO_2-exposed H-terminated diamond FETs with Al_2O_3 insulator gate** 16
Toshiyuki Oishi[1], Ryutaro Higashi[1], Kazuya Harada[1], Yuta Koga[1], Kazuyuki Hirama[2] and Makoto Kasu[1]
([1]Saga University, [2]NTT Corporation)

PA-02 (p.36) **Improved Current Collapse in AlGaN/GaN HEMTs with 3-Dimensional Field Plate Sutructure** 18
Atsuya Suzuki, Kosuke Akira, Joel Asubar, Hirokuni Tokuda and Masaaki Kuzuhara (University of Fukui)

PA-03 (p.38) **Impact of the preheating temperature on the ZnO-TFT characteristics prepared by a sol-gel method** 20
Yuki Kawakami, Takahumi Daito, Kenichi Ogata, Toshihiko Maemoto and Shigehiko Sasa (Osaka Institute of Technology)

PA-04 (p.40) **A Potentiometric Glucose Sensing by an Enzyme-Modified Ta_2O_5/ZnO/$Zn_{0.6}Mg_{0.4}O$ Solution-Gate Field-Effect Transistor** 22
Ken Iketani, Kazuto Koike, Yuichi Hirofuji, Toshihiko Maemoto, Shigehiko Sasa and Mitsuaki Yano (Osaka Institute of Technology)

PA-05 (p.42) **Cu/Al/Mo/Au and Ni/Al/Mo/Au ohmic contacts for AlGaN/GaN heterostructures** 24
Aki Sasakura, Joel Asubar, Hirokuni Tokuda and Masaaki Kuzuhara (University of Fukui)

PA-06 (p.44) **Electrical characterization of GaAs/GaAs bonding interfaces** 26
Li Chai, Jienbo Liang, Shota Nishida, Masashi Morimoto and Naoteru Shigekawa (Osaka City University)

PA-07 (p.46) **Electrical properties of n+-Si/n-GaN junctions by room temperature bonding** 28
Takuya Nishimura[1], Jianbo Liang[1], Noriyuki Watanabe[2] and Naoteru Shigekawa[1]
([1]Osaka City University, [2]NTT Corporation)

PA-08 (p.48) **Current Collapse in AlGaN/GaN HEMTs with a GaN Cap Layer** 30
Satoshi Yoshida, Yoshiki Sakaida, Joel Asubar, Hirokuni Tokuda and Masaaki Kuzuhara (University of Fukui)

PA-09 (p.50) **Polarity Dependent Radiation Hardness of GaN** **32**
Msayuki Matsuo[1], Takayuki Murayama[1], Kazuto Koike[1], Shigehiko Sasa[1], Mitsuaki Yano[1], Shun-Ichi Gonda[3], Ryoya Ishigami[4], Kyo Kume[4], Akira Uedono[2], Tomomi Ohtomo[5], Erika Furukawa[5], Yoshiki Yamazaki[5], Kazunobu Kojima[5] and Shigefusa Chichibu[5]
([1]Osaka Institute of Technology, [2]University of Tsukuba, [3]Osaka University, [4]The Wakasa Wan Energy Research Center, [5]Tohoku University)

PA-10 (p.52) **High Drain Current and Low On-Resistance in AlGaN/GaN HEMTs with Au-Plated Ohmic Electrodes** **34**
Yudai Suzuki, Kouhei Tone, Joel Asubar, Masaaki Kuzuhara and Hirokuni Tokuda (University of Fukui)

PA-11 (p.54) **High Breakdown Voltage AlGaN/GaN HEMTs on Free-Standing GaN Substrate** **36**
Jiehong Ng, Kouhei Tone, Joel Asubar, Hirokuni Tokuda and Masaaki Kuzuhara (University of Fukui)

PA-12 (p.56) **Electrical Conduction Mechanisms of Zinc-Oxide Thin Films Prepared by RF Sputtering** **38**
Jiesheng Zhang, Tadashi Saitoh and Yasuhisa Omura
(Kansai University)

PB-01 (p.58) **Two-Dimensional Model for Asymmetric Double-Gate Tunnel FET Considering the Source-Channel Junction Depletion Region** **40**
Hongfei Lv[1], Shingo Sato[1], Yasuhisa Omura[1] and Abhijit Mallik[2]
([1]Kansai University, [2]University of Calcutta)

PB-02 (p.60) **Film Thickness Dependence of the Micro-Wall Solar Cell with Electric-Field Effect** **42**
Kohei Ohki, Takashi Kusakabe, Naoto Matsuo and Akira Heya
(University of Hyogo)

PB-03 **(p.62)** **Interface characteristics of Si/Si junctions by using surface-activated bonding** 44
Shoji Yamajo, Masashi Morimoto, Jianbo Liang and Naoteru Shigekawa (Osaka City University)

PB-04 **(p.64)** **Fabrication and characterization of Si-based bipolar transistor structures using low-temperature bonding** 46
Sae Shimizu, Shota Nishida, Jianbo Liang, Masashi Morimoto and Naoteru Shigekawa (Osaka City University)

PB-05 **(p.66)** **Effective Normal Field of Average Inversion Layer for InGaAs n-channel MOSFETs** 48
Yuta Goto, Akira Hiroki and Akihiro Matsuda
(Kyoto Institute of Technology)

PB-06 **(p.68)** **Countermeasure of TWINE against Power Analysis Attack** 50
Yusuke Nozaki, Kensaku Asahi and Masaya Yoshikawa
(Meiji University)

PB-07 **(p.70)** **Macromodeling of Operational Amplifiers for Overdrive Circuit Design** 52
Yuki Yamatoya, Akira Hiroki and Hirokazu Oda
(Kyoto Institute of Technology)

PB-08 **(p.72)** **Evaluation of the extraction method of mobility in InGaAs n-MOSFET** 54
Akihiro Matsuda, Akira Hiroki and Yuta Goto
(Kyoto Institute of Technology)

PB-09 **(p.74)** **Macromodeling of Operational Amplifiers for Compressor Circuit Design** 56
Oda Hirokazu, Akira Hiroki and Yuki Yamatoya
(Kyoto Institute of Technology)

PB-10 **(p.76)** **Improving Linearity of CMOS Power Amplifier for LTE Application** 58
Tso-Yu Wu and Jeng-Rern Yang
(Yuan Ze University)

PC-01 (p.78) **Hall Effect in a p-type poly-Si Thin-Film Transistor with Hall Terminals** **60**
Haruki Shiga[1], Akito Yoshikawa[1], Takaaki Matsumoto[1], Shogo Miyamura[1], Tokiyoshi Matsuda[1], Tokuro Ozawa[2], Koji Aoki[2], Chih-Che Kuo[2] and Mutsumi Kimura[1],
([1]Ryukoku University, [2]AU Optronics Corporation Japan)

PC-02 (p.80) **Characteristic Analysis of Thin-Film Phototransistors** 62
Shota Haruki, Takahiro Fuchiya, Takayuki Kadonome, Takumi Tanaka, Tokiyoshi Matsuda and Mutsumi Kimura
(Ryukoku University)

PC-03 (p.82) **Fabrication of visible-light-responsive titanium oxide microspheres by liquid-phase laser ablation** **64**
Ryota Kajimoto, Yi Sun, Toshihiko Maemoto, Yoshiyuki Harada and Shigehiko Sasa (Osaka Institute of Technology)

PC-04 (p.84) **Hybrid-type Temperature Sensor using n-type Low-temperature Processed poly-Si Thin-Film Transistors** **66**
Shuhei Kitajima, Katsuya Kito, Hisashi Hayashi, Tokiyoshi Matsuda and Mutsumi Kimura (Ryukoku University)

PC-05 (p.86) **Vibration mode analysis on piezoelectric diaphragms for ultrasonic microsensors** **68**
Taiki Nishiumi, Kaoru Yamashita, Hikaru Tanaka, Kaito Arai and Minoru Noda (Kyoto Institute of Technology)

PC-06 (p.88) **Fabrication of the solar-blind photodetector based on $Ni_xMg_{1-x}O$ films by radio-frequency sputtering** **70**
Hiroki Nishitani, Kohei Ohta, Mitsuru Inada, Tomohiro Shimizu, Shoso Shingubara and Tadashi Saitoh (Kansai University)

PC-07 (p.90) **Neuron MOS Inverter and Source Follower using Thin-Film Transistors** **72**
Nao Nakamura, Kenji Shimada, Tokiyoshi Matsuda and Mutsumi Kimura (Ryukoku University)

PC-08 **(p.92)** **Evaluation of In_2O_3 thin film deposited by RF magnetron sputtering** **74**
Toshihiro Yoshioka, Junji Ogawa, Masahiro Yuge, Tokiyoshi Matsuda and Mutsumi Kimura (Ryukoku University)

PC-09 **(p.94)** **Evaluation of SnO_2 / Al_2O_3 thin film deposited by RF magnetron sputtering** **76**
Junji Ogawa, Toshihiro Yoshioka, Masahiro Yuge, Tokiyoshi Matsuda and Mutsumi Kimura (Ryukoku University)

PC-10 **(p.96)** **Basic Properties of Resistive Memory Diode Composed of $BaTiO_3$ Ferroelectric Thin Film by MOD Process** **78**
Toshiyuki Sugie, Shuhei Hashimoto, Ziyang Zhang, Kaoru Yamashita and Minoru Noda (Kyoto Institute of Technology)

PC-11 **(p.98)** **Photo-excited carrier transport of CuPc/C_{60} organic thin-film solar cells** **80**
Nozomi Isobe, Tomoki Miyake, Shozou Yamanaka, Tadashi Saitoh and Mitsuru Inada (Kansai University)

6/5 ……………………………………

Session B (Silicon Devices)

9:30-10:10 – Invited –

B-1 **(p.102)** **Evolution of Nanoscale Silicon CMOS Technology for Ultra Low Power Application** **83**
Takashi Matsukawa, Takahiro Mori, Yongxun Liu, Shin-Ichi O'Uchi, Shinji Migita and Meishoku Masahara (AIST)

10:10-10:30

B-2 **(p.104)** **A Simulation Study on Soft Error Rate in STT-MRAM** 85
Go Wakimura, Toshimasa Matsuoka and Yoshinari Kamakura (Osaka University)

Short Break (10:30-10:40)

10:40-11:00

B-3 **(p.106)** **Impacts of Orientation and Cross-sectional Shape on Hole Mobility of Si Nanowire MOSFETs** **87**
Hiroaki Fujihara, Naoya Morioka, Hajime Tanaka, Jun Suda and Tsunenobu Kimoto (Kyoto University)

11:00-11:20

B-4 **(p.108)** **Effects of Internal Electric Filed on Efficiency of Carrier Multiplication Solar Cells** **89**
Futo Hashimoto and Nobuya Mori (Osaka University)

Lunch (11:20-12:30)

Session C (Emerging Devices)

12:30-13:10 – Invited –

C-1 (p.112) CMOS Circuits and Nanodevices for Spike Based Neural Computing **92**
Takashi Morie (Kyushu Institute of Technology)

13:10-13:30

C-2 (p.114) Thermoelectric Properties of a-InGaZnO Thin Film 95
Yuta Fujimoto, Mutsunori Uenuma, Yasuaki Ishikawa and Yukiharu Uraoka (NAIST)

Short Break (13:30-13:40)

13:40-14:00

C-3 (p.116) Properties of novel atmospheric pressure plasma generator inducing surface airflow by scanning discharge **97**
Tomoshige Furuhi, Shuichi Kawata and Takahiro Takada
(Murata Manufacturing Co., Ltd.)

14:00-14:20

C-4 (p.118) Low Drift MEMS Humidity Sensor by Intermittent Heating 99
Hideaki Ooe, Takeshi Eimori, Masanobu Nomura, Hiroshi Nishikawa, Katsumi Fujimoto and Takashi Hasegawa
(Murata Manufacturing Co., Ltd.)

14:20-14:40

C-5 (p.120) Temperature dependence of magnetoresistance characteristics of the on-state of resistive random access memory with ferromagnetic electrode **101**
Daisuke Ito, Yoshifumi Hamada, Shintaro Otuka, Tomohiro Shimizu and Shoso Shingubara (Kansai University)

Short Break (14:40-14:50)

Session D (Microwave Theory and Techniques)

14:50-15:10

D-1 **(p.124)** **Discrete-type 24GHz SPDT FET Switch for Millimeter-wave WiCoPT** **104**
Hiroya Hojo and Toshio Ishizaki (Ryukoku University)

15:10-15:30

D-2 **(p.126)** **1.2kW Power Combiner Unit using Phase Control for 2.4GHz band** **106**
Hikaru Ikeda, Tomohide Kamiyama, Tadashi Nitta, Takashi Uno, Motoyoshi Iwata, Kazuhiro Yahata
(Panasonic Corporation)

15:30-15:50

D-3 **(p.128)** **Design of Harmonic Processing Circuit for Microwave GaN-HEMT Power Amplifier** **108**
Gaku Nishio, Keigo Nakatani and Toshio Ishizaki
(Ryukoku University)

Short Break (15:50-16:00)

Poster Viewing Session

16:00-17:30 at Poster Room

Short Break (17:30-17:40)

Closing

17:40-18:00 Award and Closing: Yukiharu Uraoka (NAIST)