

2021 28th International Workshop on Active-Matrix Flatpanel Displays and Devices (AM-FPD 2021)

**Virtual Conference
29 June – 2 July 2021**



**IEEE Catalog Number: CFP2193R-POD
ISBN: 978-1-6654-3029-6**

**Copyright © 2021, International Society of Functional Thin Film Materials and Devices (FTFMD)
All Rights Reserved**

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2193R-POD
ISBN (Print-On-Demand):	978-1-6654-3029-6
ISBN (Online):	978-4-9912169-1-6

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

PROGRAM

Date: Tuesday, June 29

Opening Session (13 : 00~13 : 15)

Welcome Address

H. Hamada, *Kinki Univ., Japan*

Award Presentation

Session1 :Keynote (13 : 15~14 : 20)

13:20-13:50 **1_1 Modulation Spectroscopies for The Characterization of Electronic Properties in Organic Semiconductor Devices.....1 (INVITED)**

H. Naito^{1,*}

¹⁾ *Osaka Prefecture Univ., JAPAN*

13:50-14:20 **1_2 Novel Passivating Contacts for Silicon Photovoltaics.....5 (INVITED)**

T. Matsui^{1,*} and H. Sai¹⁾

¹⁾ *Global Zero Emission Res. Ctr., Nat'l Inst. of Advanced Industrial Sci. and Technol.(AIST), JAPAN*

— Break —

Session2 :New Trends in Science and Technology for PVs R&D

(14 : 30~15 : 40)

14:35-15:00 **2_1 Application of Machine Learning for Crystal Growth of Bulk and Film Silicon.....8 (INVITED)**

K. Kutsukake^{1,*}

¹⁾ *RIKEN, JAPAN*

15:00-15:20 **2_2 Activation of 300-Mm-Diameter-Phosphorus-Implanted Silicon Substrates by Wireless Carbon Heating Tubes.....11**

S. Saito^{1,*}, K. Onodera¹⁾, T. Miyazaki^{1,2)}, T. Uehara¹⁾, T. Arima¹⁾, M. Hasumi¹⁾, G. Kobayashi³⁾, I. Serizawa³⁾, W. Kubo¹⁾, T. Ueno¹⁾ and T. Sameshima¹⁾

¹⁾ *Tokyo Univ. of Agriculture and Technol., JAPAN*, ²⁾ *Techno Research., Ltd., JAPAN*, ³⁾ *ORC MANUFACTURING Co., Ltd., JAPAN*

15:20-15:40 **2_3 Peeling Technique by Two-Dimensional MoSe₂ Atomic Layer for Bifacial-Flexible Cu(In,Ga)Se₂ Solar Cells.....15**

T. Nishimura^{1,*}, A. Mavlonov¹⁾, J. Chantana¹⁾, Y. Kawano¹⁾ and T. Minemoto¹⁾

¹⁾ *Ritsumeikan Univ., JAPAN*

— Break —

Special Session :Next Stage of Displays (15 : 50~17 : 10)

- 15:55-16:20 SP_1 Ferroelectric Liquid Crystal Pixels with Extremely Small Pixel Pitch for Holographic Displays.....17 (INVITED)**
S. Aso^{1,*}, K. Aoshima¹, R. Higashida¹, N. Funabashi¹, J. Shibasaki¹, T. Ishinabe², Y. Shibata², H. Fujikake² and K. Machida¹
¹ *Sci. & Technol. Res. Labs.(STRL), Japan Broadcasting Corp.(NHK), JAPAN,* ² *Tohoku Univ., JAPAN*
- 16:20-16:45 SP_2 Redundant Pixel Design and External Mura Compensation for LTPS TFT Full Color MicroLED Display.....21 (INVITED)**
K. Imaizumi^{1,*}, M. Tamaki¹, K. Aoki¹, R. Yokoyama¹, S. Nakamitsu¹, H. Ito¹, K. Yamanoguchi¹, M. Nishide¹, F. Rahadian¹, S. Matsuda¹, E. Lang² and L. Hoeppe²
¹ *Kyocera Corp., JAPAN,* ² *OSRAM Opto Semiconductors GmbH, GERMANY*
- 16:45-17:10 SP_3 OLED, MiniLED, MicroLED and QNED: The Battle for The Next Generation of Televisions.....25 (INVITED)**
Z. Bouhamri^{1,2,*} and E. Virey¹
¹ *Yole Developpement, FRANCE,* ² *Yole KK, JAPAN*

Date: Wednesday, June 30

Special Symposium1 :The Future Vehicle Displays (10 : 00~10 : 45)

10:05-10:45 SS1_1 A Novel Fully Transparent Photoluminescent Display.....29 (INVITED)
T. Sun^{1,*}
¹⁾ Sun Innovations Inc., USA

Special Symposium2 :Forecast of Display Market (10 : 45~11 : 30)

10:50-11:30 SS2_1 Display-Based HMI in The Software Defined Vehicle Era.....33 (INVITED)
S. Wu^{1,*}
¹⁾ Omdia,TAIWAN

— Lunch —

**Special Symposium3 :Key Devices and Developments
for Vehicle Display** (13 : 00~14 : 25)

13:05-13:45 SS3_1 Active Matrix Micro-Electromechanical-Systems Based Displays.....N/A (INVITED)
N. Fruehauf^{1,*}
¹⁾ Univ. of Stuttgart, GERMANY
13:45-14:25 SS3_2 Wide -Color Gamut OLED Technologies for High-Luminance Operation at High
Temperature.....38 (INVITED)
K. Hamada^{1,*}, S. Mori¹⁾ and H. Tanabe¹⁾
¹⁾ Tianma Japan, Ltd., JAPAN

— Break —

Special Symposium4 :Trends for Future Vehicle Display (14 : 40~15 : 25)

14:45-15:25 SS4_1 Automotive Displays – Trends and Technologies.....164 (INVITED)
D. S. Hermann^{1,*}
¹⁾ Volvo Car Corp., SWEDEN

— Break —

**Special Symposium5 :Future and Lighting Application
for Vehicle Display (15 : 40~17 : 05)**

- 15:45-16:25 SS5_1 Flexible OLED Lighting and Signage for Automotive Application.....42 (INVITED)**
C. May^{1,*}
¹⁾ Fraunhofer Inst. for Organic Electronics, Electron Beam and Plasma Technol. FEP, GERMANY
- 16:25-17:05 SS5_2 The Challenges of Adapting Displays Into New Car Interiors.....46 (INVITED)**
M. Stegemann^{1,*}
¹⁾ Via Optronics AG, GERMANY

Date: Thursday, July 1

Symposium1 :Variety of TFT Technologies for Emerging Applications

(9 : 25~11 : 00)

- 09:30-10:00 S1_1 Vacuum Field Emission Transistor in Nanometer Era.....48 (INVITED)
J. Han^{1,*}
¹⁾ Center for Nanotechnology, NASA Ames Research Center, USA
- 10:00-10:30 S1_2 Skin-Like Sensor Systems by Intrinsically Stretchable Electronic Materials.....49
(INVITED)
N. Matsuhisa^{1,2,3,*}
¹⁾ Keio Univ., JAPAN, ²⁾ Keio Global Res. Inst., JAPAN, ³⁾ Japan Sci. and Technol. Agency, PRESTO, JAPAN
- 10:30-11:00 S1_3 Gigahertz Large-Area Electronic Devices and Circuits for Wireless Applications.....51
(INVITED)
C. Wu^{1,*}, Y. Ma¹, Y. Mehlman¹, S. Wagner¹, J.C. Sturm¹ and N. Verma¹
¹⁾ Princeton Univ., USA

— Break —

Symposium2 :Advanced Materials and Processes

for Next Generation PVs (11 : 10~12 : 45)

- 11:15-11:45 S2_1 Technologies to Improve The Profitability of Silicon PV Module Recycling.....55
(INVITED)
M. Tao^{1,*}
¹⁾ Arizona State Univ., USA
- 11:45-12:15 S2_2 Band Offset Engineering in Cu₂O-Based Heterojunctions for High-Efficiency Tandem Photovoltaics.....59 (INVITED)
N. Nakagawa^{1,*}, S. Shibasaki¹, Y. Honishi¹, Y. Mizuno¹, Y. Nishida¹, M. Yamazaki¹ and K. Yamamoto¹
¹⁾ Toshiba Corp., JAPAN
- 12:15-12:45 S2_3 Development of π -Conjugated Materials for Efficient Organic Solar Cells.....62 (INVITED)
I. Osaka^{1,*}
¹⁾ Hiroshima Univ., JAPAN

— Lunch —

Symposium3 :Development of Fabrication and Analysis for Thin Film Devices (13 : 45~ 15 : 20)

- 13:50-14:20 **S3_1 Low-Temperature Solid-Phase Crystallization of Group IV Material Thin Films.....64 (INVITED)**
K. Toko^{1,*}
¹⁾ *Univ. of Tsukuba, JAPAN*
- 14:20-14:50 **S3_2 Silicon Spintronics for Electronic Devices.....67 (INVITED)**
M. Shiraishi^{1,*}
¹⁾ *Kyoto Univ., JAPAN*
- 14:50-15:20 **S3_3 Growth of A High Quality GaN Wafer From Point Seeds by The Na-Flux Method.....70 (INVITED)**
M. Imanishi^{1,*}, S. Usami¹⁾, M. Maruyama¹⁾, M. Yoshimura¹⁾ and Y. Mori¹⁾
¹⁾ *Osaka Univ., JAPAN*

— Break —

Poster Session (15 : 30~17 : 40)

FPD p

- P_01 LTPS Pixel Circuit Using Additional Capacitor Structure to Prevent Leakage Current for Low-Framerate Displays.....73**
Y. Chen^{1,*}, B. Chen¹⁾, J. Chang¹⁾ and C. Lin¹⁾
¹⁾ *Nat'l Cheng Kung Univ., TAIWAN*
- P_02 Characteristics of Argon-Ion-Implanted Amorphous-InGaZnO.....77**
K. Yasuta^{1,*}, T. Ui¹⁾, T. Ikeda²⁾, D. Matsuo²⁾, T. Sakai²⁾, S. Dohi¹⁾, Y. Setoguchi²⁾, E. Takahashi²⁾, Y. Andoh²⁾ and J. Tatemichi¹⁾
¹⁾ *NISSIN ION EQUIPMENT CO., LTD., JAPAN*, ²⁾ *NISSIN ELECTRIC CO., LTD., JAPAN*

TFT p

- P_03 Effects of Germanium Composition on Performance of Continuous-Wave Laser Lateral Crystallization N-Channel Polycrystalline Silicon-Germanium Thin-Film Transistors on Glass Substrate.....81**
A. Hara^{1,*} and K. Kitahara²⁾
¹⁾ *Tohoku Gakuin Univ., JAPAN*, ²⁾ *Shimane Univ., JAPAN*
- P_04 Non-Volatile Memory Using A Ga-Sn-O TFT with A Stacked Gate Insulator Film of SiO₂ and (Bi,La)₄Ti₃O₁₂85**
T. Fukui^{1,*}, K. Nakagawa¹⁾ and M. Kimura¹⁾
¹⁾ *Ryukoku Univ., JAPAN*

TFMD p

- P_06 Ferroelectric Thin Film for A Capacitor-Type Synapse in Neuromorphic Systems.....89**
Y. Ishisaki^{1,*}, H. Umemura¹⁾, D. Matsukawa¹⁾, E. Tokumitsu²⁾ and M. Kimura¹⁾
¹⁾ *Ryukoku Univ., JAPAN*, ²⁾ *Japan Advanced Inst. of Sci. and Technol.(JAIST), JAPAN*
- P_07 Stacked Cross-Point Memory Using IGZO Thin Film for Synaptic Elementes.....92**
E. Iwagi^{1,*} and M. Kimura^{1,2)}
¹⁾ *Ryukoku Univ., JAPAN*, ²⁾ *Nara Inst. of Sci. and Technol.(NAIST), JAPAN*
- P_08 Investigation of Orientation in The Thin Films of Conjugated Polymer and NIR Dye Blends Fabricated by Friction Transfer Method.....96**
Y. Kurokawa^{1,*}, S. Nagamatsu¹⁾ and S.S. Pandey¹⁾
¹⁾ *Kyushu Inst. of Technol., JAPAN*

- P_09 Structural and Electrical Properties of Nanographene Prepared From Pentacene by Hot Mesh Deposition and Soft X-Ray Irradiation.....100**
 A. Heya^{1,*}, M. Niibe¹, K. Kanda¹, R. Yamasaki² and K. Sumitomo¹
¹⁾ *Univ. of Hyogo, JAPAN*, ²⁾ *Tocalo Co., Ltd., JAPAN*
- P_10 GTO Thin Film Thermoelectric Conversion Device Manufactured by RF Magnetron Sputtering Method.....102**
 Y. Yamamoto^{1,*}, T. Aramaki¹, R. Ito¹ and M. Kimura¹
¹⁾ *Ryukoku Univ., JAPAN*
- P_11 Improved Carrier Mobility of Poly-Ge Ultrathin Films on Insulator by Solid-Phase Crystallization Combined with A-Si Capping Layers.....106**
 R. Hara^{1,*}, M. Chiyozone¹ and T. Sadoh¹⁾ *Kyushu Univ., JAPAN*
- P_12 Improvement of GeO₂/Ge Interface Characteristics by Hf-Post Metallization Annealing and Hf-Post Metallization Oxidation.....108**
 H. Horiguchi¹, H. Ino^{1,*}, Y. Iwazaki¹ and T. Ueno¹
¹⁾ *Tokyo Univ. of Agriculture and Technol., JAPAN*
- P_13 Fabrication of High-Performance Ge-MOS Structure Using Al₂O₃/TiO₂ Stacked Gate Insulating Film.....112**
 K. Toyoda¹, K. Ito^{1,*}, Y. Iwazaki¹ and T. Ueno¹
¹⁾ *Tokyo Univ. of Agriculture and Technol., JAPAN*
- P_14 Low-Temperature Solid-Phase Crystallization of High-Sn Concentration SiSn on Insulator.....116**
 K. Okamoto^{1,*}, T. Kosugi¹ and T. Sadoh¹⁾
¹⁾ *Kyushu Univ., JAPAN*

LATE NEW p

- P_L1 Four-Terminal Polycrystalline-Silicon Thin-Film Transistors with High-K HfO₂ Dielectric on Glass Substrate.....118**
 K. Kudo¹, J. Kimura¹, T. Suzuki¹, N. Nishiguchi¹ and A. Hara^{1,*}
¹⁾ *Tohoku Gakuin Univ., JAPAN*
- P_L2 Performance Improvement of Solution-Processed Organic Floating-Gate Transistor Memories via Tuning The Work Function of Gate Electrodes.....120**
 N. Nishida^{1,*}, S. Tazuhara¹, R. Hattori¹, M. Higashinakaya¹, T. Nagase¹, T. Kobayashi¹ and H. Naito¹
¹⁾ *Osaka Prefecture Univ., JAPAN*
- P_L3 Fabrication of Lead Halide Perovskite Thin Films by Laser Alternate Deposition : Variation of Physical Properties with Layered Structure.....122**
 N. Matsuki^{1,*}, Y. Iida¹, K. Kamada¹, S. Toda¹ and T. Sato¹
¹⁾ *Kanagawa Univ., JAPAN*

Date: Friday, July 2

Session3 :FPD (9 : 25~10 : 35)

- 09:30-09:55 **3_1 Novel Flexible Films with High Gas Barrier Layers by Sputtering and ALD.....125**
(INVITED)
M. Kodan^{1,*}, M. Sugimoto¹, N. Kawamura¹, T. Yuki¹ and H. Nakada¹
¹ *Innovation Center for Organic Electronics (INOEL), Yamagata Univ., JAPAN*
- 09:55-10:15 **3_2 New Pixel Circuit with Negative Feedback Scheme for AMOLED Smartwatch Displays.....129**
J. Chang^{1,*}, L. Shih² and C. Lin¹
¹ *Nat'l Cheng Kung Univ., TAIWAN, ² AU Optronics Corp., TAIWAN*
- 10:15-10:35 **3_3 Inverted ZnCuInS/ZnS-Based Quantum-Dot Light-Emitting Diodes with Substrate Temperature Variation of Sputtered ZnO Film Layer.....133**
M.M.R. Biswas^{1,*} and H. Okada¹
¹ *Univ. of Toyama, JAPAN*

— Break —

Session4 :Novel Fabrication Processing and Applications (10 : 45~11 : 55)

- 10:50-11:15 **4_1 Electret-Based Vibrational Energy Generator Composed of Polarmolecules for OLED.....135**
(INVITED)
Y. Tanaka^{1,2,*}, N. Matsuura¹, Y. Tazo¹, H. Kayaguchi¹ and H. Ishii¹
¹ *Chiba Univ., JAPAN, ² Japan Sci. and Technol. Agency, PRESTO, JAPAN.*
- 11:15-11:35 **4_2 Double-Layer ReRAM with In-Ga-Zn-O Thin Film for Neuromorphic.....137**
T. Katagiri^{1,*}, K. Morigaki¹, K. Yachida¹ and M. Kimura¹
¹ *Ryukoku Univ., JAPAN*
- 11:35-11:55 **4_3 Oxygen Ratio Effect on Zinc Oxide Films Fabricated by Radio Frequency Magnetron Sputtering for Photoluminescence Type Gas Sensor Application.....140**
H.S. Wai^{1,*}, T. Ueda¹ and C. Li¹
¹ *Kochi Univ. of Technol., JAPAN*

— Lunch —

Session5 :Oxide TFT Technology (13 : 00~14 : 10)

- 13:05-13:30 **5_1 LTPO Driving Technology for The Next Generation.....144** (INVITED)
J.C. Kim^{1,2,*}, J.S. Yoo², H.W. Hwang², H.C. Choi², Y.M. Ha² and H.J. Kim¹
¹ *Yonsei Univ., KOREA, ² LG Display, KOREA*
- 13:30-13:50 **5_2 High-K Solution Processed Hybrid Gate Insulators for Amorphous Oxide Thin-Film Transistors and Its Temperature and Thickness Dependence.....147**
J.P. Bermundo^{1,*}, P. Kesorn¹, N. Yoshida¹ and Y. Uraoka¹
¹ *Nara Inst. of Sci. and Technol.(NAIST), JAPAN*
- 13:50-14:10 **5_3 Performance Enhancement of Solution-Processed In-Zn-O Thin-Film Transistors via Low-Temperature Wet Annealing Ambients.....150**
M.P.A. Jallorina^{1,*}, J.P.S. Bermundo¹ and Y. Uraoka¹
Nara Inst. of Sci. and Technol.(NAIST), JAPAN

— Break —

Session6 :Artificial TFT Applications & Sensor (14 : 20~15 : 30)

14:25-14:50 6_1 Artificial Synapse Based on MoS₂ Memtransistor for In-Memory Computing.....154 (INVITED)

K. Ang^{1,2,*})

¹⁾ Nat'l Univ. of Singapore, SHINGAPORE, ²⁾ Agency for Sci., Technol. and Res.^{A*STAR}, SHINGAPORE

14:50-15:10 6_2 Study on Bulk-Heterojunction Organic Photodetectors Based on Inverted Structure Toward Near-Infrared Narrowband-Light Detection Devices.....158

H. Kajii^{1,*}) and M. Kondow¹⁾

¹⁾ Osaka Univ., JAPAN

15:10-15:30 6_3 Comparison of Switching TFT Operation in Output Frequency Dependence of The Artificial Retina Using LTPS-TFT.....160

K. Toyoda^{1,*}), N. Naitou¹⁾, R. Ichikawa¹⁾, M. Mori¹⁾ and M. Kimura¹⁾

¹⁾ Ryukoku Univ., JAPAN

Closing Remarks (15 : 30~15 : 40)