

# **49th Annual SID Symposium, Seminar, and Exhibition 2011**

**(Display Week 2011)**

**Los Angeles, California  
15-20 May 2011**

**Volume 1 of 3**

**ISBN: 978-1-61839-096-7  
ISSN: 0097-966X**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2011) by the Society for Information Display  
All rights reserved.

Printed by Curran Associates, Inc. (2011)

For permission requests, please contact the Society for Information Display  
at the address below.

Society for Information Display  
1475 S. Bascom Ave.  
Suite 114  
Campbell, California 95008-4006

Phone: (408) 879-3901  
Fax: (408) 879-3833 or (408) 516-8306

[office@sid.org](mailto:office@sid.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)



May 17-20, 2011  
Los Angeles Convention Center  
Los Angeles, California USA  
[www.sid2011.org](http://www.sid2011.org)

## VOLUME 1 Table of Contents: Sessions 3-40

### Session 3: Liquid-Crystal Lenses for 3D Displays

- 3.1: **Distinguished Student Paper: Polarization Independent Adaptive Microlens Using a Blue-Phase Liquid Crystal** (Page 1)  
Yan Li, Shin-Tson Wu *University of Central Florida*
- 3.2: **A Negative Liquid-Crystal Lens with Multi-Ring Electrodes in Unequal Widths** (Page 5)  
Chao-Jui Hsu, Paul C.-P. Chao *National Chiao Tung University*
- 3.3: **Design and Modeling of a Refractive Liquid Crystal Lens for Tunable Optical Correction in 3-D Stereoscopic Displays** (Page 9)  
Liwei Li, Lei Shi, Douglas Bryant, Philip J. Bos *Liquid Crystal Institute, Kent State University*  
Tony Van Heugten, Dwight Duston *eVision, Inc.*
- 3.4: **Sizing Multi-electrodes in an LCL-lens for Minimizing the Crosstalk in a 3D Auto-stereoscopic Display** (Page 13)  
Yung-Yuan Kao, Paul C.-P. Chao *National Chiao Tung University*
- 3.5: **Dual Directional Overdriving Method for Fast Response LC-lenses on Autostereoscopic 3D Display** (Page 17)  
Po-Chuan Chen, Chih-Wei Chen, Yi-Pai Huang *National Chiao Tung University*  
Jian-Jun Li *Super-D Co., Ltd.*

### Session 4: Oxide TFTs I

- 4.1: **Low-Temperature-Processed IGZO TFTs for Flexible AMOLED with Integrated Gate Driver Circuits** (Page 21)  
Kentaro Miura, Tomomasa Ueda, Shintaro Nakano, Nobuyoshi Saito, Yujiro Hara, Keiji Sugi, Tatsunori Sakano, Hajime Yamaguchi, Isao Amemiya, Keiko Akimoto, Hisashi Kameoka, Junichi Tonotani *Toshiba Corporation*
- 4.2: **Integrated Scan Driver with Oxide TFTs Using Floating Gate Method** (Page 25)  
Chul-Kyu Kang, Yong-Sung Park, Seong-Il Park, Yeon-Gon Mo, Byung-Hee Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- 4.3: **High-Performance a-IGZO TFT with Nano-Dots Doping** (Page 28)  
Hsiao-Wen Zan, Wu-Wei Tsai, Chia-Hsin Chen, Chuang-Chuang Tsai, Hsin-Fei Meng *National Chiao Tung University*
- 4.4: **A 6-inch Field-Sequential Blue Phase Mode LCD with Integrated Driver using Highly Reliable Oxide Semiconductor** (Page 32)  
Yoshiharu Hirakata, Daisuke Kubota, Akio Yamashita, Hiroyuki Miyake, Masahiko Hayakawa, Jun Koyama, Shunpei Yamazaki *Semiconductor Energy Laboratory Co.,*

Ltd.

Kenichi Okazaki, Rai Sato, Takayuki Cho, Katsuaki Tochibayashi, Masayuki Sakakura  
*Advanced Film Device Inc.*

## Session 5: Electronic Paper I

- 5.1: **Invited Paper: A 5.7" Color Mirasol® XGA Display for High Performance Applications** (Page 36)  
Brian Gally, Alan Lewis, Koorosh Aflatooni, William Cummings, Surya Ganti, Mark Todorovich, Robert Van Lier Van Lier *Qualcomm MEMS Technologies, Inc.*
- 5.2: **Photonic Crystal Display Materials** (Page 40)  
Andre C. Arsenault, Hai Wang, Fergal Kerins, Ulrich Kamp *Opalux Inc.*  
Geoffrey A. Ozin *University of Toronto*
- 5.3: **Novel Design for Color Electrochromic Display** (Page 42)  
Tohru Yashiro, Shigenobu Hirano, Yoshihisa Najoh, Yoshinori Okada, Kazuaki Tsuji, Mikiko Abe, Akishige Murakami, Hiroyuki Takahashi, Koh Fujimura, Hitoshi Kondoh  
*Ricoh Co., Ltd.*
- 5.4: **Wireless Smart Card with Electronic Paper Dot Matrix Display Using QR-LPD Technology** (Page 46)  
Akihiko Yokoo *Bridgestone Corporation*  
Tadashi Kubota, Yasunobu Saida *Delta Electronics, Inc.*  
Ryo Sakurai, Shingo Oono, Yoshitomo Masuda *Bridgestone Corporation*  
Reiji Hattori *Kyushu University*

## Session 6: VA Mode

- 6.1: **High Performance VA-LCD Compensation Film Made with Environmentally Friendly Material for VA-LCD** (Page 50)  
Jun Takeda, Hirofumi Tooyama, Isao Fujiwara, Takumi Andou, Yoji Ito, Keiji Mihayashi  
*Fujifilm Corporation*
- 6.2: **Inverse Four-Domain Twisted Nematic Liquid Crystal Mode for High Transmittance and Wide Viewing Angle Characteristics** (Page 54)  
Soo In Jo, Sang Woong Choi, Seul Gee Lee, You-Jin Lee, Chang-Jae Yu, Jae-Hoon Kim  
*Hanyang University*
- 6.3: **Amplified Intrinsic Fringe-Field MVA LCDs for WVGA Smart Phones, Full HD 1920 x 1080 Tablet PCs, and LCD TVs** (Page 58)  
Hiap L. Ong, Juishu Chou *Kyoritsu Optronics Co., Ltd.*
- 6.4: **A Multi-Mode LCD with Wide Viewing Angle and High Reflectance for Sunlight Readability** (Page 62)  
Ruibo Lu, Mary Lou Jepsen, Carlin Vieri, John Ryan *Pixel Qi Corporation*

## Session 7: Novel Applications

- 7.1: **Inverse Confocal Sensor Based on a Bidirectional OLED Display** (Page 66)  
Constanze Grossmann, Franziska Schulz, Susanne Zwick, Stefan Riehemann  
*Fraunhofer Institute for Applied Optics and Precision Engineering*  
Rigo Herold, Bernd Richter, Uwe Vogel *Fraunhofer Institute for Photonic Microsystems*  
Gunther Notni *Fraunhofer Institute for Applied Optics and Precision Engineering*  
Andreas Tuennermann *Fraunhofer Institute for Applied Optics and Precision Engineering & Friedrich Schiller University*
- 7.2: **Integrated Organic Semiconductor Optoelectronic Devices as Real-Time and Indicator-Free Biosensors** (Page 70)  
Yu-Chiang Chao, Shih-De Yeh, Hsin-Fei Meng, Hsiao-Wen Zan *National Chiao Tung University*  
Gao-Fong Chang *National Chiao Tung University & Academia Sinica*  
Chen-Hsiung Hung *Institute of Chemistry, Academia Sinica*  
Tzu-Ching Meng *Institute of Biological Chemistry, Academia Sinica*
- 7.3: **A Window LCD Achieved by Color-Sequential Methods** (Page 74)  
Chi-Chung Tsai, Shang-Han Yu, Kuang-Hung Chien, Hsueh-Fang Yin, Tzu-Pin Lin  
*Chunghwa Picture Tubes, Ltd.*
- 7.4: **A Stacking Color Electrowetting Display for the Smart Window Application** (Page 78)  
Wei-Yen Lee, Yung-Hsiang Chiu, Chao-Chiun Liang, Wei-Yuan Cheng, Kuo-Lung Lo, Yu-Hsiang Tsai *Industrial Technology Research Institute*

## Session 8: Liquid-Crystal Technology for 3D

- 8.1: **Quarter Wave Retardation Film for Improving Viewing-Angle Properties in Time-**

**Sequential Stereoscopic 3D Liquid Crystal Displays** (Page 82)

Makoto Ishiguro, Katsufumi Ohmuro, Yukito Saitoh, Yuta Takahashi, Jun Watanabe, Keiichi Miyazaki, Keiji Mihayashi *Fujifilm Corporation*

**8.2: Submillisecond Response Sheared Polymer-Network Liquid Crystals for 3D Displays** (Page 86)

Jie Sun, Yuan Chen, Shin-Tson Wu *University of Central Florida*  
Robert A. Ramsey *Meadowlark Optics*

**8.3: Stereo Glasses with Fast Low Voltage FLC Shutters** (Page 90)

Alexander L. Andreev, Igor N. Kompanets *P.N. Lebedev Physical Institute*  
Vasily A. Ezhov *A.M. Prokhorov General Physics Institute*  
Alexander G. Sobolev *Megavision, JSC*

**8.4: Contrast-Enhanced High-Speed Polarization Modulator for Active-Retarder 3D Displays** (Page 93)

Jesper Osterman *LC-TEC Displays AB*  
Terry Scheffer *Motif, Inc.*

**8.5: WITHDRAWN**

**Session 9: Mobile Display Technology**

**9.1: Invited Paper: Turning Points in Mobile Display Development** (Page 97)

Hiroyuki Ohshima, Dai-Liang Ting *Chimei Innolux Corp.*

**9.2: LTPS Five-Mask Process for 3.5-in. WVGA Top-Emission AMOLED Displays** (Page 101)

Iljeong Lee, Choongyoul Im, Youngdae Kim, Dohyun Kwon, Jongyun Kim, Moosoon Ko, Juwon Yu, Jongmo Yeo Yeo, Jangsoon Im, Sungchul Kim *Samsung Mobile Display Co., Ltd.*

**9.3: Control of Threshold Voltage in Back Channel Etch Type Amorphous Indium Gallium Zinc Oxide Thin Film Transistors** (Page 104)

Seung-Min Lee, Dae-Won Kim, Im-Kuk Kang, Kyung-Han Seo, Yong-Yub Kim, Jae Wook Park, Chang Il Ryo, Joonsoo Ha, Yong-Ho Choi, Young Ju Koh, Dong-Min Han, Jong-Uk Bae, Hyun-Sik Seo, Bong Chul Kim, Soo Youle Cha, Chang Dong Kim, Myungchul Jun, Yonk Kee Hwang *LG Display Co., Ltd.*

**Session 10: Electronic Paper II**

**10.1: Invited Paper: Roll-to-Roll Flexible Display for e-Paper Applications** (Page 107)

Janglin Chen, Jyh-Wen Shiu, Wan-Wen Chiu, Chen-Chu Tsai, Chieh-Yi Huang *Industrial Technology Research Institute*

**10.2: Electrofluidic Displays: Multi-Stability and Display Technology Progress** (Page 111)

Kenneth A. Dean, Kaichang Zhou, Steve Smith, Brian Brollier, Hari Atkuri, John Rudolph *Gamma Dynamics*  
Shu Yang, Stephanie Chevalliot, Eric Kreit, Jason Heikenfeld *University of Cincinnati*

**10.3: Ultra low-power Electrowetting-based Displays Using Dynamic Frame Rate Driving** (Page 114)

Andrea Giraldo, Romaric Massard, Jurrien Mans, Eric Derckx, Jo Aubert, Jan Mennen *Samsung LCD Netherlands R&D Center*

**10.4L: Late-News Paper: Joule-Heating Induced Lift-Off Technology for Large-Area Flexible AMOLED Displays** (Page 118)

Moo-Soon Ko, Choong-youl Im, Iljeong Lee, Jong-hyuk Lee, Sung-chul Kim *Samsung Mobile Display Co., Ltd.*  
Won-Eui Hong, Jae-Sang Ro *EnSilTech Corporation*

**Session 11: Blue-Phase LC I**

**11.1: Invited Paper: The World's First Blue-Phase Liquid Crystal Display** (Page 121)

Hyeokjin Lee, Hong-Jo Park, Oh-Jeong Kwon, Sung Jae Yun, Jae Hong Park, Seunggho Hong, Sung-Tae Shin *Samsung Electronics Co., Ltd.*

**11.2: A New Process for Manufacture of Low Voltage, Polymer-Stabilized Blue Phase LCDs** (Page 125)

Daisuke Kubota, Tetsuji Ishitani, Akio Yamashita, Sachiko Yamagata, Yuko Oe, Tomohiro Tamura, Makoto Ikenaga, Takahiro Yamamoto, Momoko Kato, Masaru Nakano, Ryo Hatsumi, Yusuke Kubota, Tsutomu Murakawa, Masahiko Hayakawa, Takeshi Nishi, Satoshi Seo, Yoshiharu Hirakata, Shunpei Yamazaki *Semiconductor Energy Laboratory Co., Ltd.*

Kenichi Okazaki, Rai Sato, Takayuki Cho, Masayuki Sakakura *Advanced Film Device Inc.*

**11.3: Temperature Effect on Polymer-Stabilized Blue-Phase LCDs** (Page 129)

## Session 12: Near-to-Eye and Head-Worn Display Applications

- 12.1: **Invited Paper: Image Source Evaluation and Selection for Rugged Near-Eye Displays** (Page 132)  
James E. Melzer *Rockwell Collins Optronics*
- 12.2: **Invited Paper: Quantum Dot Light Emitting Diodes for Near-to-Eye and Direct View Display Applications** (Page 135)  
Seth Coe-Sullivan, Zhaoqun Zhou, Yuhua Niu, James Perkins, Matthew Stevenson, Craig Breen, Peter T. Kazlas, Jonathan S. Steckel *QD Vision, Inc.*
- 12.3: **Ruggedized Color AMLCD and LED Backlight Illumination for Night Vision Applications** (Page 13J)  
Benjamin Phipps, Claude Gaudette, Scott Young *Wamco, Inc.*
- 12.4: **Interactive See-Through Augmented-Reality Smart-Display System** (Page 143)  
Uwe Vogel, Rigo Herold, Bernd Richter, Judith Baumgarten, Karsten Fehse, Karl Leo *Fraunhofer Institute for Photonic Microsystems*  
Peter Schreiber, Marcel Sieler *Fraunhofer Institute for Applied Optics and Precision Engineering*

## Session 13: Flexible Displays

- 13.1: **Invited Paper: Electrochromic Display: Full-Color Technology, Flexible, Roll-to-Roll Processing, etc.** (Page 147)  
Yi-Wen Chung, Ai-Kang Li, Jian-Hong Lee, Chih-Jen Tsai, Huang-Cheng Fang *South Industrial Technology Research Institute*
- 13.2: **A Floating-Gate OTFT-Driven AMOLED Pixel Circuit for Variation and Degradation Compensation in Large-Sized Flexible Displays** (Page 149)  
Tsung-Ching Huang, Koichi Ishida, Tsuyoshi Sekitani, Makoto Takamiya, Takao Someya, Takayasu Sakurai *University of Tokyo*
- 13.3: **Improvement in Temperature Durability of Bendable Electronic Paper Using Cholesteric Liquid Crystals (ChLCs)** (Page 153)  
Yoshihisa Kurosaki, Yoshinori Kiyota, Toshiaki Yoshihara *Fujitsu Laboratories Ltd.*
- 13.4: **High-Resolution and Multi-Color R2R Flexible e-Papers** (Page 157)  
Heng-Yin Chen, Ju-Yuan Su, Cheng-Yi Wu, Chao-Wen Chen, Chih-Lung Chin *Industrial Technology Research Institute (ITRI)*  
Hsuan-Kai Lin *Industrial Technology Research Institute (ITRI South)*  
Chao-Chiun Liang *Industrial Technology Research Institute (ITRI)*

## Session 14: 3D TV: LCD

- 14.1: **Invited Paper: Advanced Technologies for 3D Liquid Crystal Display Television** (Page 160)  
Yuichiro Yamada, Kenji Okamoto, Koichi Miyachi *Sharp Corporation*
- 14.2: **WITHDRAWN**
- 14.3: **Gray-Level Crosstalk and Temporal Synchronization of Different Shutter-Glass 3D TVs** (Page 164)  
Pierre Boher, Thierry Leroux, Thibault Bignon *ELDIM*
- 14.4: **Polarizer Glasses Type 3-D TVs Having High Image Quality with Active Retarder 3-D Technology** (Page 168)  
Sung-Min Jung, Young-Bok Lee, Hyung-Ju Park, Jin-Woo Park, Wook Jeon, Seung-Kyu Choi, Dong-Hoon Lee, Woo-Nam Jeong, Jeong-Hyun Kim *LG Display Co. Ltd.*
- 14.5L: **Late-News Paper: Comparisons Between a Liquid Crystal Refractive Lens and a Diffractive Lens for 3D Displays** (Page 171)  
Lu Lu, Lei Shi, Philip J. Bos *Kent State University*  
Tony Van Heugten, Dwight Duston *eVision LLC*

## Session 15: AMOLEDs and AMLCDs

- 15.1: **Invited Paper: Super Grain Silicon Technology for AMOLED TV Applications** (Page 175)  
Ki-Yong Lee *Samsung Mobile Display Co., Ltd.*
- 15.2: **Green Laser Sequential Lateral Solidification (G-SLS) Process for AMOLED Applications** (Page 179)  
Minhwan Choi, Seong Hyun Jin, Se Hun Park, Jae Hwan Oh, Young Jin Chang, Won-Kyu Lee, Jae Beom Choi, Hye Dong Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*

- 15.3: **Smart Power-Saving Driving Scheme for AMOLEDs Using Dynamic Power Rail Control** (Page 183)  
Sang-Myeon Han, Baek-woon Lee, In-hwan Ji, Si-duk Sung, Alexander Arkhipov, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- 15.4: **A Novel High Speed Integrated Gate Driver Circuit Using a-Si TFT for 240-Hz FHD LCD TVs** (Page 186)  
Hong-Jae Shin, Mi-Young Son, Byung-Hoon Kim, Yong-Ho Kim, Chung-Ah Lee, Kwang-Soo Kim, Jung-Hoon Choi, Jeom-Jae Kim, Chang-Ho Oh, In-Byeong Kang *LG Display Co. Ltd.*

## Session 16: Flexible Backplanes

- 16.1: **Distinguished Paper: Rollable Electrochromic Display with Amorphous-Silicon Gate Driver Circuit Integrated** (Page 190)  
Chao-Chien Chiu, Yuan-Jun Hsu, Ming-Hsien Lee, Chia-Tien Peng, Wei-Ming Huang *AU Optronics Corp.*
- 16.2: **World-Best Performance LTPS TFTs with Robust Bending Properties on AMOLED Displays** (Page 194)  
Moojin Kim, Junhyuk Cheon, Jaeseob Lee, Yonghwan Park, Sungguk An, Taewoong Kim, Dongun Jin, Hoonkee Min, CheolHo Yu, Sungchul Kim *Samsung Mobile Display Co., Ltd.*  
*Jin Jang Kyung Hee University*
- 16.3: **A 13-in. Flexible Color EPD Driven by Low-Temperature a-Si TFTs** (Page 198)  
Keiichi Akamatsu, Akihito Nishiike, Kenta Masuda, Yuichi Kato, Takashi Maruyama, Masato Suzuki, Ryo-ichi Yasuda, Akira Yumoto, Takahiro Kamei, Tetsuo Urabe *Sony Corporation*
- 16.4: **Low-Temperature Fabrication of Flexible AMOLED Displays Using Oxide TFTs with Polymer Gate Insulators** (Page 202)  
Mitsuru Nakata, Hiroto Sato, Yoshiki Nakajima, Yoshihide Fujisaki, Tatsuya Takei, Takahisa Shimizu, Mitsunori Suzuki, Hirohiko Fukagawa, Genichi Motomura, Toshihiro Yamamoto, Hideo Fujikake *NHK Science and Technology Research Laboratories*

## Session 17: Blue-Phase LC II

- 17.1: **Invited Paper: Optically Isotropic Liquid Crystals for Electro-optical Devices** (Page 206)  
Yasuhiro Haseba, Shin-ichi Yamamoto, Takafumi Kuninobu, Kohki Sago *Chisso Petrochemical Co. Ltd.*  
*Yasutomo Nagano Chisso Petrochemical Co. Ltd. & Kyushu University*  
*Hirotsugu Kikuchi Kyushu University*
- 17.2: **Polymer Effect on the Electro-Optic Properties of Blue-Phase Liquid Crystals** (Page 210)  
Jin Yan, Shin-Tson Wu *University of Central Florida*
- 17.3: **Hysteresis and Residual Birefringence Free Polymer-stabilized Blue Phase Liquid Crystal** (Page 213)  
Chun-Yuan Fan, Chun-Ta Wang, Tsung-Hsien Lin *National Sun Yat-Sen University*  
Fang-Cheng Yu, Tai-Hsiang Huang, Chu-Yu Liu, Norio Sugiura *AU Optronics Corp.*

## Session 18: Colors of Vision

- 18.1: **Invite Paper: The Effect of Surround on Color and Image Appearance** (Page 216)  
Ming Ronnier Luo *University of Leeds*
- 18.2: **Distinguished Paper: Appropriate Luminance of LCD-TV Screens under Actual Viewing Conditions at Home** (Page 221)  
Tatsuhiko Matsumoto, Shuichi Haga, Takehiro Nakatsue *Sony Corporation*  
Satoru Kubota, Yuta Kubota, Kenta Imabayashi *Seikei University*  
Kazuyuki Kishimoto, Seiichi Goshi, Shigeki Imai *Sharp Corporation*  
Youichi Igarashi *Panasonic Liquid Crystal Display Co., Ltd.*
- 18.3: **Rendering Digital Cinema and Broadcast TV Content to Wide Gamut Display Media** (Page 225)  
Rodney L. Heckaman *Rochester Institute of Technology*  
James Sullivan *Entertainment Experience, LLC*
- 18.4: **Color Perception in LED Projectors** (Page 229)  
Shih-Fang Liao, Tsung-Hsun Yang, Cheng-Chung Lee *National Central University*  
Kirk Chang, Nemo Chiu *Delta Electronics, Inc.*

## Session 19: Large-Area, Head-Up, and Rugged Display Applications

- 19.1: **A Novel Electrowetting-Based Display for Future Smart Window Application** (Page 232)  
Shu-Wei Kuo, Kuo-Long Lo, Wei-Yuan Cheng, Hsin-Hung Lee, Yu-Hsiang Tsai, Pei-Pei Cheng, Pei-Ju Su, Jyh-Wen Shiu *Industrial Technology Research Institute*
- 19.2: **Ambient Environment Reactive Displays** (Page 236)  
Chang Yuan *Sharp Laboratories of America*
- 19.3: **Invited Paper: Creative Integration of Christie MicroTiles in Tiled Display Applications** (Page 240)  
Delia Zsivanov, Michael Perkins *Christie Digital Systems Canada Inc.*
- 19.4: **Novel Depth Perception Controllable Method of WARP Under Real Space Conditions** (Page 244)  
Takashi Sasaki, Aira Hotta, Akihisa Moriya, Takahiro Murata, Haruhiko Okumura, Kazuo Horiuchi, Naotada Okada, Kenji Takagi, Yoshihisa Nozawa, Osamu Nagahara *Toshiba Corporation*
- 19.5: **Unique Approach for Replacement Displays in Military Systems** (Page 248)  
Frank J. Evagues III, Frank J. Evagues IV, Farrah K. Evagues *Tactical Displays, Inc.*  
Lawrence E. Tannas Jr. *Tannas Electronics Displays, Inc.*

## Session 20: Green Display Applications

- 20.1: **A Method for Color BreakUp Suppression in a Color Sequential Display** (Page 251)  
Kai-Ting Hu, Tzu-Pin Lin, Chi-Chung Tsai, Wen-Chih Tai, Kuang-Hung Chien *Chunghwa Picture Tubes, Ltd.*
- 20.2: **Efficiency Improvement of Photovoltaic Device-Integrated Organic Light Emitting Diode by Applying a Distributed Bragg Reflector** (Page 255)  
Wei-En Hsu, Hoang Yan Lin *National Taiwan University*
- 20.3: **All-In-One Monitor Capable of Power-over-Ethernet or USB** (Page 259)  
Shannon Siefken, Fedja Kecman, James Thielen, Garry Du *3M Company*
- 20.4: **Distinguished Paper: Optimizing the Brightness of Reflective Displays in Mobile Applications** (Page 261)  
Ion Bitu, Hamid Tavakoli, Evgeni Poliakov, Kebin Li, Thomas Fiske, Jennifer Gille, Russel A. Martin *Qualcomm MEMS Technologies, Inc.*

## Session 21: AMOLED Driving

- 21.1: **Distinguished Paper: 120 Hz 3D Driving for AMOLED with Interleaved Scan and Emission Operation** (Page 264)  
Baek-woon Lee, Sangmyeon Han, Si-duk Sung, In-hwan Ji, Kwang-sub Shin, Brian H. Berkeley, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- 21.2: **Driving Method for a 2D-3D Switchable AMOLED Display Using Progressive or Simultaneous Emission** (Page 268)  
Bo-Yong Chung, Dong-Wook Park, Yong-Sung Park, Deok-Young Choi, Keumnam Kim, Byung-Hee Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- 21.3: **Low Frequency Driving Methods for 3D Displays** (Page 272)  
Young-In Hwang, Yong-Sung Park, Keum-Nam Kim, Byung-Hee Kim, Brian H. Berkeley, Sang-Soo Kim *Samsung Mobile Display Co., Ltd.*  
Byoung-Deog Choi *SungKyunKwan University*

## Session 22: Integrated Flexible Electronics

- 22.1: **Invited Paper: Stretchable and Foldable Displays using Organic Transistors with High Mechanical Stability** (Page 276)  
Tsuyoshi Sekitani, Takao Someya *University of Tokyo*
- 22.2: **Invited Paper: Flexible Polymer Electrets for Flexible High-Performance, Paper-Like Speakers, and Touch Panel Applications** (Page 280)  
Dar-Ming Chiang, Jen-Luan Chen, Bo-Sian Du, Chun-Jen Wang, Shu-Ru Lin *Taiwan Electrets Electronics Co., Ltd.*
- 22.3: **Flexible Top-gate Amorphous InGaZnO TFTs Array for AMOLED Applications** (Page 284)  
Yung-Hui Yeh, Chun-Cheng Cheng, Chang-Yu Lin, Geng-Tai Ho, Ming-Jiue Yu, Benjamin Chih-Ming Lai, Chyi-Ming Leu *Industrial Technology Research Institute*
- 22.4: **Flexible Electrophoretic Display Driven by Solution-Processed OTFTs** (Page 288)  
Nobuhide Yoneya, Hideki Ono, Yui Ishii, Kazuo Himori, Nobukazu Hirai, Hironobu Abe, Akira Yumoto, Norihito Kobayashi, Kazumasa Nomoto, Tetsuo Urabe *Sony Corporation*

## Session 23: Blue-Phase LC III



- 23.1: **Invited Paper: New Materials for Polymer-Stabilized Blue Phase** (Page 292)  
Michael Wittek, Norihiko Tanaka, Matthias Bremer, Detlef Pauluth, Kazuaki Tarumi,  
Ming-Chou Wu *Merck KGaA*  
Dong-Mee Song, Seung-Eun Lee *Merck Advanced Technologies*
- 23.2: **Q-Tensor-Based Numerical Modeling of Blue-Phase LCDs** (Page 294)  
Henning Woehler, Michael E. Becker *Autronic-Melchers GmbH*
- 23.3: **A Vertical-Field-Driven Polymer-Stabilized Blue Phase Liquid Crystal Displays** (Page 298)  
Yong-Hun Kim *Kyungpook National University*  
Sung-Taek Hur *Kyung Hee University*  
Kyung-Woo Park, Do hyuk Park *Kyungpook National University*  
Suk-Won Choi *Kyung Hee University*  
Hak-Rin Kim *Kyungpook National University*

## Session 24: Visual Perception

- 24.1: **Measuring the Perceived Contrast of Natural Images** (Page 302)  
Andrew M. Haun, Eli Peli *Harvard Medical School*
- 24.2: **Estimating the Perceptual Limits of Mobile Displays** (Page 305)  
Fahad Zafar *US Food and Drug Administration & University of Maryland*  
Mina Choi *US Food and Drug Administration & The George Washington University*  
Aldo Badano *US Food and Drug Administration*
- 24.3: **Human-Body Swing Affects the Visibility of Scrolled Characters with Direction Dependency** (Page 309)  
Sakuichi Ohtsuka, Shintaro Oka, Ken Kihara, Takaki Tsuruda, Marina Seki *Kagoshima University*
- 24.4: **Subjective and Objective Assessments of Color Break-Up on Field Sequential Color Display Devices** (Page 313)  
Akiko Yoshida, Masamitsu Kobayashi, Yasuhiro Yoshida *Sharp Corporation*

## Session 25: Digital Cinema

- 25.1: **Interference Filter System for High-Brightness and Natural-Color Stereoscopic Imaging** (Page 317)  
Arnold Simon, Helmut Jorke *INFITEC GmbH*
- 25.2: **Invited Paper: Dual-Paraboloid-Reflector Illumination System for Digital Cinema** (Page 320)  
George Ouyang, Kenneth Li *Wavien, Inc.*
- 25.3: **LED Array with Recycling for High-Power Projector Applications** (Page 323)  
Kenneth Li *Wavien, Inc.*
- 25.4: **A Laser-Based Digital Cinema Projector** (Page 326)  
Barry D. Silverstein, Andrew F. Kurtz, Joseph R. Bietry, Michael Marcus, Gary Nothhard  
*Kodak*

## Session 26: Panel-Driving Technology

- 26.1: **Invited Paper: Driving Mirasol® Displays: Addressing Methods and Control Electronics** (Page 330)  
Russel A. Martin, Alan Lewis, Marc Mignard, Nao Chuei, Rob van Lier, Alok Govil, Mark Todorovich, Koorosh Aflatooni, Brian Gally, Clarence Chui *Qualcomm MEMS Technologies*
- 26.2: **Distinguished Student Paper: A 10-bit Compact Current DAC Architecture for Large-Size AMOLED Displays** (Page 334)  
Ki-Duk Kim *KAIST & Samsung Electronics*  
Sung-Woo Lee, Gyu-Sung Park, Chang-Byung Park, Gyu-Hyeong Cho *KAIST*  
Yoon-Kyung Choi, Myunghee Lee *Samsung Electronics*
- 26.3: **Design of a Low Power Consumption a-IGZO TFT-based Vcom Driver Circuit with Long-Term Reliability** (Page 338)  
Hoon Jeong *Kyung Hee University & LG Display Co., Ltd.*  
Mallory Mativenga *Kyung Hee University*  
Sang Gul Lee, Yong Min Ha *LG Display Co., Ltd.*  
Jin Jang *Kyung Hee University*
- 26.4: **Novel Driving and Panel Design of Frame Inversion Method for High Aperture Ratio in the Large Size and High Resolution LCD TV Panel** (Page 342)  
Doyoung Lee, Hong-Man Moon, Do-Sung Kim, Se-Eung Lee, Sung-Hak Jo, Dae-Hyun

Nam, Seong-Hun Jeong, Gyu-Tae Kang, Myungchul Jun *LG Display*

**26.5: Block-Wise Luminance Control Algorithm for AMOLED Image Sticking Mitigation** (Page 346)

Do-Wan Kim, Won Jun Choe, Kwang-Suk Shin, Byung-Hee Kim, Sang Soo Kim  
*Samsung Mobile Display Co., Ltd.*

**Session 27: 3D TV: OLED**

**27.1: Integrated pMOS Gate Driver for a 3D AMOLED Display** (Page 349)

Kyung-Hoon Chung, Bo-Yong Chung, Seong-Il Park, Dong-Wook Park, Sang-Moo Choi, Keumnam Kim, Byung-Hee Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*

**27.2: 31-inch FHD AMOLED 3-D TV using Emission-Switch Control Method** (Page 353)

Joong-Sun Yoon, Ji-Min Lee, Hyun-Haeng Lee, Young-Hak Lee, Du-Hwan Oh, Tae-Gung Kim, Kil-Hwan Oh, Bum-Sik Kim *LG Display Co., Ltd.*

**27.3: 1.2 Gbps GDDR3 Physical Layer for 3D AMOLED TV** (Page 357)

Moon-Sang Hwang, Kwangsuk Shin, Won Jun Choe, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*

Han-Kyu Chi, Deog-Kyoon Jeong *Seoul National University*

**27.4: Distinguished Student Paper: Simultaneous Programming and Emission Driving Using External Compensation Method for 3D AMOLED Displays** (Page 361)

Hai-Jung In, Kyong-Hwan Oh, Chang-Woo Song, Oh-Kyong Kwon *Hanyang University*

**Session 28: Low-Power Active-Matrix Alternatives**

**28.1: Invited Paper: Active Matrix Displays for Ereaders Using Microcup Electrophoretics** (Page 365)

Robert A. Sprague *SiPix Imaging, Inc.*

**28.2: Color Sequential LC Display Using High Reliable Oxide Semiconductors with Monochrome Electronics** (Page 369)

Hideaki Shishido, Seiko Amano, Kouhei Toyotaka, Hiroyuki Miyake, Tsutomu Murakawa, Takeshi Nishi, Yoshiharu Hirakata, Jun Koyama, Shunpei Yamazaki *Semiconductor Energy Laboratory Co., Ltd.*

Kenichi Okazaki, Takuya Handa, Masayuki Sakakura *Advanced Film Device Inc.*

**28.3: A Pixel Design for TFT-LCDs with Variable Refresh Rates** (Page 373)

Willem den Boer *ScanVue Technologies*

**28.4: A 3.5-in. Bendable Active Matrix Electrowetting Display** (Page 377)

Cheng-Yi Chen, Chih-Yuan Wang, Wen-Chun Wang, Cheng-Chieh Hung, Ting-Yu Chang, Yuan-Fa Chen, Yi-Te Lee *Wintek Corporation*

Wei-Yuan Cheng, Kuo-Long Lo *Industrial Technology Research Institute*

**28.5L: Late-News Paper: A Novel Non-Emissive Display with Enormous Contrast Ratio and Viewing-Angle Free** (Page 381)

Toshiki Matsuoka, Tomoko Teranishi, Shun Ueki, Takuma Tomotoshi, Yozo Narutaki, Yasuhisa Itoh *Sharp Corporation*

**Session 29: Display Manufacturing: Flexible Displays**

**29.1: Invited Paper: Electrical Testing of Roll-to-Roll SAIL Manufactured Flexible Display Backplanes** (Page 384)

Richard E. Elder, Warren B. Jackson, Mehrban Jam, Albert Jeans, Hao Luo, John Maltabes, Craig Perlov, Carl Taussig, Steven Trovinger *HP Labs*

Fernando Gomez-Pancorbo *Stanford University*

Marcia Almanza-Workman, Robert A. Garcia, HanJun Kim, Ohseung Kwon *Phicot Inc.*  
Frank Jeffrey *PowerFilm, Inc.*

**29.2: Flexible Glass Substrates for Organic TFT Active Matrix Electrophoretic Displays** (Page 387)

Po-Yuan Lo, Jau-Min Din, Je-Ping Hu, Yi-Jen Chan *Industrial Technology Research Institute*

Sean Garner, Mingqian He, James Lin, Xinghua Li, Mike Sorenson, Jianfeng Li, Pat Cimo, Chris Kuo *Corning Incorporated*

**29.3: Color ChLC E-Paper Display with 100 um Flexible Glass Substrates** (Page 389)

Kuan-Wei Wu, Yuan Chang Liao, Jyh Wen Shi, Yi Shou Tsai, Kuan Ting Chen, Yu Cheng Lai, Chun-Chun Lai, Yuh-Zheng Lee *Industrial Technology Research Institute*  
Sean Garner, James Lin, Xinghua Li, Pat Cimo *Corning Incorporated*

**Session 30: Cholesteric LCDs**

**30.1: A New Drive Scheme for Cholesteric Reflective Displays under Active Matrix**

**Addressing** (Page 392)

Rafael S. Zola, Young-Cheol Yang, Deng-Ke Yang *Kent State University*  
Heng-Yin Chen, Chien-Chih Hsu, Chih-Jen Chen, Chao-Chiun Liang, Kung-Lung Cheng  
*Industrial Technology Research Institute*

**30.2: Single Layer Full Color Cholesteric Display** (Page 396)

Clinton Braganza, Mathew Bowser, John Krinock, Duane Marhefka, Kevin Dysert, Erica Montbach, Asad Khan, J. William Doane, Chih-Lung Chin, Kung-Lung Cheng, Yi-Shou Tsai, Yuan-Chang Liao, Chih-Jen Chen, Chao-Chiun Liang, Jyh-Wen Shiu, Janglin Chen  
*Industrial Technology Research Institute*

**30.3: Master Parameter Governing the Response Time of Reflective Cholesteric Liquid Crystal Displays** (Page 400)

Young-Cheol Yang, Rafael S. Zola, Yue Cui, Deng-Ke Yang *Kent State University*  
Heng-Yin Chen, Chien-Chih Hsu, Chih-Jen Chen, Chao-Chiun Liang *Industrial Technology Research Institute*

**30.4: A Low Cost, Full Color Cholesteric LCD with Low Voltage and Crosstalk-Free Drive Scheme** (Page 404)

Chao-Chiun Liang, Yuan-Chang Liao, Chih-Lung Chi, Chih-Jen Chen *Industrial Technology Research Institute*  
Duane Marhefka, Erica Montbach, Clinton Braganza *Kent Displays, Inc.*  
Yun-Shuo Chang, Yi-Shou Tsai, Jyh-Wen Shiu, Kung-Lung Cheng *Industrial Technology Research Institute*  
Asad Khan, J. William Doane *Kent Displays, Inc.*  
Chung-Shu Chang, Janglin Chen *Industrial Technology Research Institute*

**Session 31: Medical/Visual Performance**

**31.1: Invited Paper: The Impact of Self-Luminous Electronic Devices on Melatonin Suppression** (Page 408)

Mariana G. Figueiro, Basar Erdener, Asiri Jayawardena, Natalia Lesnia, Rinara Reh, Levent Sahin, Kate Sweater, Brittany Wood, Lisa Yue *Rensselaer Polytechnic Institute*

**31.2: Invited Paper: Enhanced Minimally Invasive Surgery by 2D to 3D Conversion** (Page 412)

Kai-Che Liu *Asian Institute of TeleSurgery*  
Ludovic Angot, Wei-Jia Huang, Chun-Te Wu *Industrial Technology Research Institute*  
Stephane Nicolau, Hung-Sheng Wu *Asian Institute of TeleSurgery*

**31.3: Experimental Methodology to Measure the Veiling Glare Limit for Detection Tasks in High-Dynamic-Range Displays** (Page 416)

Mina Choi *US Food and Drug Administration & The George Washington University*  
Diksha Sharma *US Food and Drug Administration*  
Fahad Zafar *US Food and Drug Administration & University of Maryland*  
Wei-Chung Cheng *US Food and Drug Administration*  
Luigi Albani *BARCO*  
Vesna Zderic *The George Washington University*  
Aldo Badano *US Food and Drug Administration*

**31.4: A Preliminary Study on the Frame Glare by Reflected Light for Its Allowable Level and Evaluation Method** (Page 420)

Yuzo Hisatake *Japan Electronics and Information Technology Industries Association & Japan Ergonomics National Committee*  
Naoaki Umezu, Chiaki Kato, Yoshihiko Nakano *Japan Ergonomics National Committee*

**Session 32: Despeckling Despicable Speckle and Rejecting Ambient Light**

**32.1: Laser Projection System with Variable Speckle Generator** (Page 424)

Makio Kurashige, Kazutoshi Ishida, Tomoe Takanokura, Yasuyuki Ohyagi, Masachika Watanabe *Dai Nippon Printing Co., Ltd.*

**32.2: Speckle Suppression by 2D Spatial Light Modulator in Laser Projection System** (Page 428)

Yan-Shuo Chang, Hoang Yan Lin *National Taiwan University*  
Wei-Feng Hsu *National Taipei University of Technology*

**32.3: Laser-Illuminated Three-Panel LCoS Projector with a Vibrating Diffractive Microlens-Array Beam Shaper** (Page 432)

Chieh-Hui Chen, Po-Hung Yao, Cheng-Huan Chen *National Tsing Hua University*  
Spencer Lee *Cinetron Technology, Inc.*  
Fong-Zhi Chen, Wei-Yao Hsu, Yuan-Chieh Cheng *Instrument Technology Research Center*

#### 32.4: WITHDRAWN

### Session 33: Image and Video Processing

- 33.1: **Invited Paper: Dynamic Range Management for Displays for Reduced Power and Improved Ambient Contrast** (Page 436)  
Viacheslav N. Chesnokov *Apical Limited*
- 33.2: **Intelligent Adaptive Color Management Unit for Digital Video** (Page 440)  
Sujith Srinivasan *Marvell India Pvt. Ltd.*  
Nikhil Balram *Ricoh Innovations, Inc.*
- 33.3: **View Synthesis for Advanced 3D Video** (Page 444)  
Ilsoon Lim, Jaejoon Lee, Dusik Park *Samsung Advanced Institute of Technology*
- 33.4: **Energy-Based Hole-Filling Technique for Reducing Visual Artifacts in Depth-Image-Based Rendering** (Page 448)  
Alexander Limonov, Ju Yong Chang *Samsung Electronics*

### Session 34: Autostereoscopic and Integral Imaging

- 34.1: **Invited Paper: TRANSFORMERS - Autostereoscopic Displays Running in Different 3D Operating Modes** (Page 452)  
René de La Barré, Klaus Hopf, Silvio Jurk, Ulrich Leiner *Fraunhofer Heinrich - Hertz Institute*
- 34.2: **Field Sequential LC Barrier for a Full Resolution Auto-stereoscopic 3D Display** (Page 456)  
Kihyung Kang, Soobae Moon, Sangmoo Park, Seondeok Hwang, Sergey Shestak, Junghoon Yoon, Dongchoon Hwang *Samsung Electronics*
- 34.3: **Multi-User 3D Film on Directional Sequential Backlight System** (Page 460)  
Chih-Hung Ting, Ching-Yi Hsu, Che-Hsuan Yang, Yi-Pai Huang *National Chiao Tung University*  
Han-Wen Tsai, Chih-Chieh Yu *Coretronic Corporation*
- 34.4: **Resolution Enhancement of Integral Imaging 3D Display Using Multi-Directional Elemental Images** (Page 464)  
Md. Ashrafal Alam, Ganbat Baasantseren, Nam Kim, Jae-Hyeung Park *Chonbuk National University*
- 34.5L: **Late-News Paper: Glasses-Free 2D/3D Switchable Display Using a Unique Light Guide** (Page 468)  
Masaru Minami, Kanji Yokomizo, Yoshihide Shimpuku *Sony Corporation*

### Session 35: Oxide TFTs II

- 35.1: **A 14-in. AMOLED TV Driven by HfInZnO Thin-Film Transistors** (Page 472)  
Yeon-Gon Mo, Minkyu Kim, Kwang S. Kim, Chang M. Park, Yong S. Park, Chaun Gi Choi, Keehan Uh, Sungchul Kim *Samsung Mobile Display Co., Ltd.*
- 35.2: **High-Performance Solution-Processed Oxide TFT with Dual Channel at Low Temperature** (Page 476)  
Woong Hee Jeong, Kyung Min Kim, Dong Lim Kim, You-Seung Rim, Hyun Jae Kim *Yonsei University*  
Kyung-Bae Park, Myung-Kwan Ryu *Samsung Advanced Institute of Technology*
- 35.3: **Distinguished Paper: A Novel Self-Aligned Top-Gate Oxide TFT for AM-OLED Displays** (Page 479)  
Narihiro Morosawa, Yoshihiro Ohshima, Mitsuo Morooka, Toshiaki Arai, Tatsuya Sasaoka *Sony Corporation*
- 35.4L: **Late-News Paper: Metal-Oxide Thin Film Transistor with High Performance and Good Operation Stability** (Page 483)  
Gang Yu, Chan-Long Shieh, Fatt Foong, Guangming Wang, Aaron Kuo, Kaixia Yang, Jian Wang, Frankie Chang, James Peng, Boo Nilsson *CBRITE Inc.*
- 35.5L: **Late-News Paper: An Ambipolar Oxide TFT** (Page 486)  
Hideo Hosono, Kenji Nomura, Toshio Kamiya *Tokyo Institute of Technology*

### Session 36: Flexible OLEDs

- 36.1: **Invited Paper: Rollable OLED Display Driven by Organic TFTs** (Page 488)  
Kazumasa Nomoto, Makoto Noda, Norihito Kobayashi, Mao Katsuhar, Akira Yumoto, Shin-ichi Ushikura, Ryo-ichi Yasuda, Nobukazu Hirai, Gen Yukawa, Iwao Yagi *Sony Corporation*
- 36.2: **Invited Paper: Materials and Components for Flexible AMOLED Display** (Page 492)  
Dongun Jiin, Sungguk An, Hyungsik Kim, Youngji Kim, Hyunwoo Koo, Teawoong Kim,

Younggu Kim, Hoonkee Min, Sungchul Kim *Samsung Mobile Display Co., Ltd.*

- 36.3: **Invited Paper: Highly Reliable Flexible Active Matrix OLED Driven by a-Si TFT Device** (Page 494)  
Chang-Dong Kim, Soo-Young Yoon, Juhn-Suk Yoo, Myung-Chul Jun, Yong-Kee Hwang  
*LG Display R&D Center*
- 36.4: **3.4-inch Full-Color QHD AMOLED Display Using a Large-Size Flexible Substrate with Highly Reliable OS-FETs** (Page 498)  
Kaoru Hatano, Akihiro Chida, Tatsuya Okano, Nozomu Sugisawa, Takaaki Nagata, Tatsunori Inoue, Satoshi Seo, Kunihiko Suzuki, Michiko Aizawa, Shuhei Yoshitomi, Masahiko Hayakawa, Hiroyuki Miyake, Jun Koyama, Shunpei Yamazaki *Semiconductor Energy Laboratory Co., Ltd.*  
Yohei Monma, Saki Obana, Shingo Eguchi, Hiroki Adachi, Masahiro Katayama, Kenichi Okazaki, Masayuki Sakakura *Advanced Film Device Inc.*

### Session 37: Plasma-Display Protective Layer

- 37.1: **Invited Paper: Surface Electronic States of MgO Induced by a Auger Neutralization Process** (Page 501)  
Hiroshi Kajiyama, Kazuma Suesad, Shintaro Miyamoto, Keisuke Tsutsumi, Masataka Kitagaki *Hiroshima University*
- 37.2: **Invited Paper: The Role of the Impurity Diffusion Barrier for the Cathode Material in AC PDP** (Page 505)  
Ki-Woong Whang, Tae-Ho Lee, Hee-Woon Cheong *Seoul National University*  
Sven Ole Steinmüller, Jürgen Janek *Justus-Liebig-University Giessen*
- 37.3: **Wall Voltage Loss by Exoemission** (Page 508)  
Noriyuki Awaji, Harm Tolner, Shintaro Miyamoto, Hiroshi Kajiyama *Hiroshima University*
- 37.4: **Analysis on Address Discharge Characteristics of MgO Layer with MgO Single Crystal Powder under Various Panel Temperatures in AC-PDP** (Page 510)  
Jae Hyun Kim, Hyung-Dal Park, Soo-Kwan Jang, Heung-Sik Tae *Kyungpook National University*  
Jeong Hyun Seo *University of Incheon*
- 37.5L: **Late-News Paper: Investigation of the Conductivity of SrO: High-Gamma Material for the Protective Layer of AC-PDPs** (Page 513)  
Yoichi Shintani, Tomoaki Izumi, Kazushige Takagi, Manabu Inoue, Toshiaki Onimaru, Shigeo Kasahara, Naoki Kosugi, Masatoshi Kitagawa *Advanced PDP Development Center Corporation*

### Session 38: Display Manufacturing: Processes

- 38.1: **Invited Paper: Enabling High-Throughput OLED Manufacturing by Carrier-Gas-Enhanced Organic Vapor Deposition (OVPD)** (Page 516)  
Markus Gersdorff, Michael Long, Dietmar Keiper, Martin Kunat, Baskar Gopi, Claudia Cremer, Birgit Beccard, Markus Schwamberger *AIXTRON AG*
- 38.2: **Invited Paper: Fabrication of Thin Film Transistor Circuits Using Shadow Masking: A Low Cost Alternative to Conventional Lithography** (Page 520)  
Thomas Ambrose, Tim Cowen, Jeff Conrad, Whit Little, T. Peter Brody *Advantech US Inc.*
- 38.3: **A Facile Method to Identify and Lower the Moisture Content in Overcoat Materials** (Page 523)  
Kuo-Yu Huang, Wei-Chieh Yang, Maw-Song Chen, Wei-Ming Huang *AU Optonics Corporation*
- 38.4: **Full-Color Patterning of Quantum Dot (QD) Light-Emitting Diodes using QD Transplanting Techniques** (Page 526)  
Hyunduck Cho, Changhee Lee *Seoul National University*  
Jeonghun Kwak *Dong-A University*  
Dong-Myung Shin *Hongik University*  
Wan Ki Bae, Jaehoon Lim, Kookheon Char, Seonghun Lee *Seoul National University*
- 38.5L: **Late-News Paper: PVD SiO<sub>2</sub> for Metal-Oxide TFT Application** (Page 529)  
Oliver Graw, Evelyn Scheer, Anke Hellmich, Marcus Bender *PVD Display - Applied Materials*
- 38.6L: **Late-News Paper: Advanced Coatable Polarizer Technology by Using Novel Liquid Crystalline Materials and Organic Dyes** (Page 532)  
Su Hyun Park, Sang-Wook Lee, Byoung Har Hwang, Jung-Min Lee, Wook-Sung Kim, Woo-Sup Shin, Mike Jun, Yong-Kee Hwang *LG Display Co., Ltd.*

### Session 39: Pico-Projection

- 39.1: ***Distinguished Paper: Laser+LCOS: Technology Revolution*** (Page 536)  
Karl M. Gutttag, Shawn Hurley, Bill Mei *Syndiant Inc.*
- 39.2: ***Polarization Conversion System Using a Polymer Polarization Grating*** (Page 540)  
Eunseong Seo, Hong Cheol Kee, Young Kim, Seungman Jeong, Hyunho Choi, Sanghun Lee *LG Innotek Components R&D Center*  
Jihwan Kim, Ravi K. Jomanduri *North Carolina State University*  
Michael J. Escuti *ImagineOptix Corporation*
- 39.3: ***Single Packaged RGB LEDs with Recycling for Pocket and Pico-Projectors*** (Page 544)  
Kenneth Li *Wavien, Inc.*
- 39.4: ***A Metal-Based High-Resonant-Frequency Optical Scanner with a Moving-Magnet Actuator for Non-Resonant Large-Angle Scanning*** (Page 547)  
Nobuaki Takanashi, Takeshi Honda, Osamu Ishibashi, Fujio Okumura *NEC Corporation*

## **Session 40: Interface Technologies for Display**

- 40.1: ***Invited Paper: DisplayPort® 1.2, Embedded DisplayPort, and Future Trends*** (Page 551)  
Craig Raymond Wiley *Parade Technologies, Inc.*
- 40.2: ***An Improved Differential Signaling Scheme for the Chip-On-Glass Application of TFT-LCD*** (Page 555)  
Hyun-Kyu Jeon *Silicon Works Co., Ltd. & KAIST*  
Kwang-Il Oh, Yong-Hwan Moon, Jun-Ho Kim, Jung-Hwan Choi, Seok-Jae Park, Joon-Ho Na, Jae-Ryun Shim, Heong-Seog Oh, Dae-Seong Kim, Dae-Keun Han *Silicon Works Co., Ltd.*  
Jin-Sung Kim, Sung-Cheol Ha, Koo-Won Kang, Hoe-Ho Lee, Gun-Woo Do, Kyoung-Tae Moon, Jin-Kyu Kim, Hyun-Chul Choi *LG Display Co., Ltd.*  
Lee-Sup Kim *KAIST*
- 40.3: ***A 2 Gbps/lane Source Synchronous Intra-Panel Interface for Large Size and High Refresh Rate Panel with Automatic Calibration*** (Page 559)  
Seiichi Ozawa, Hironobu Akita, Shinya Suzuki, Hidetoshi Miura, Shogo Hachiya, Takayuki Murakami, Kazuhisa Sasaki, Masahiro Kato *THine Electronics, Inc.*
- 40.4: ***Invited Paper: iDP Standard for an Internal Connection in a Large-Screen Display*** (Page 563)  
Alan Kobayashi, Jason Choi *STMicroelectronics*  
Hee-Sub Lee, Changgon Kim, Dongwon Park, Buyeol Lee *LG Display Co., Ltd.*



May 17-20, 2011  
Los Angeles Convention Center  
Los Angeles, California USA  
[www.sid2011.org](http://www.sid2011.org)

## VOLUME 2

### Table of Contents: Sessions 41-73

#### Session 41: Holographic Display and 3D Image Capture

- 41.1: **Three-Dimensional Electro-Holographic Retinal Display** (Page 591)  
Jun Xia, Wenliang Zhu *Southeast University*  
Ingrid Heynderickx *Philips Research Laboratories and Technical University*
- 41.2: **Acoustooptical Scanning Holography 3D Image Capturing and Electronic Hologram Recording** (Page 595)  
Vladimir V. Petrov *Saratov State University*
- 41.3: **Spatial 3D Imaging Based on Full Analytical Holographic Computations** (Page 599)  
Jian-Wen Dong, Yuan-Zhi Liu, He-Zhou Wang *Sun Yat-Sen University*
- 41.4L: **Late-News Paper: A 360° Panoramic Stereoscopic Projection System Using a Single Projector and a Related 3D Panoramic Camera System** (Page 602)  
David Montgomery, Graham Jones *Sharp Laboratories of Europe*

#### Session 42: OLED Display I

- 42.1: **Invited Paper: High Efficiency Phosphorescent AMOLEDs: The Path to Long Lifetime TVs** (Page 606)  
Mike Hack, Woo-Young So, Peter A. Levermore, Michael S. Weaver, Julie J. Brown  
*Universal Display Corporation*
- 42.2: **Time Division Analog Driving Method to Display High Gray-scale of OLED Display** (Page 610)  
Tae-Gung Kim, Moo-Kyoung Hong, Kyoung-Don Woo, Young-Jun Hong, Joong-Sun Yoon, Soon-Girl Hong, Hong-Gyu Kim, Bum-Sik Kim *LG Display Co., Ltd.*
- 42.3: **Distinguished Paper: High Resolution AMOLED Panels for Mobile 3D Applications Using White OLEDs with Color Filters** (Page 614)  
Changwoong Chu, Sungsoo Lee, Young-Shin Lee, Sangjo Lee, Byunghee Park, Seil Kim, Hokyoon Chung, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*

#### Session 43: Capacitive Touch Systems

- 43.1: **Invited Paper: Trends and Materials in Touch Sensing** (Page 617)  
Bob Mackey *Synaptics Inc.*
- 43.2: **Mutual Capacitive Touch Screen Integrated into Thin-Film Encapsulated Active-Matrix OLEDs** (Page 621)  
HongShik Shim, SunKook Kim, YoungTea Chun, Hyuk-Jun Kwon, InSeo Kee, Woong Choi, SangYoon Lee *Samsung Advanced Institute of Technology*
- 43.3: **A Novel Flexible AMOLED with Touch Based on Flexible Universal Plane for Display Technology** (Page 625)

Jia-Chong Ho, Yu-Yang Chang, Chyi-Ming Leu, Glory Chen, Chen-Pang Kung, Hua-Chi Cheng, Jing-Yi Yan, Shu-Tang Yeh, Liang-You Jiang, Yu-Han Chien, Heng-Lin Pan, Cheng-Chung Lee *Industrial Technology Research Institute*

- 43.4: **An In-Cell Capacitive Touch-Sensor Integrated in an LTPS WSVGA TFT-LCD** (Page 629)  
Satoru Tomita, Takashi Nakamura, Tetsuo Morita, Takayuki Imai, Takashi Okada, Hirota Hayashi, Yasuo Saruhashi, Masayoshi Fuchi, Miyuki Hashimoto, Masahiro Tada, Takahiko Endo, Keiichi Saito, Hiroki Nakamura, Hideyuki Takahashi *Toshiba Mobile Display Co., Ltd.*

#### Session 44: MgO-CaO Protective Layer

- 44.1: **Invited Paper: High Luminous Efficacy PDP Using Ca(x)Mg(1-x)O Protecting Layer** (Page 633)  
Qun Yan, Xinqun Deng *Sichuan COC Display Device Co., Ltd*  
Zhegxin Lu, Fangli Xing, Xin Zhang, Cuizhen Tang, Haicheng Wei *Sichuan Siji Shuanghong Display Devices Co., Ltd.*
- 44.2: **Characteristics of a (Mg, Ca)O Thin Film Layer Sealed under Nitrogen Atmosphere** (Page 637)  
Hak-Nyun Choi, Sang-Young Kim *Hong-Ik University*  
You-Han Kim, Seok Jeong *Ceramics & Chemicals Technology Inc.*  
Yong-Seog Kim *Hong-Ik University*
- 44.3: **Investigation of Effects of Heating in Air on Ionization Potentials of MgO and CaO Films Using Metastable De-Excitation Spectroscopy** (Page 641)  
Kyohei Yoshino, Yukihiro Morita *Panasonic Corporation & Osaka University*  
Takaharu Nagatomi *Osaka University*  
Masaharu Terauchi, Takuji Tsujita *Panasonic Corporation & Osaka University*  
Yukako Doi, Takahito Nakayama, Yasuhiro Yamauchi *Panasonic Corporation*  
Mikihiko Nishitani *Osaka University & Panasonic Corporation*  
Masatoshi Kitagawa *Panasonic Corporation*  
Yoshizo Takai *Osaka University*  
Yasushi Yamauchi *National Institute for Materials Science*
- 44.4: **UV Emission Characteristics of Crystal Type MgO, MgO:Si, MgO:Sc, and Mg<sub>0.85</sub>Ca<sub>0.15</sub>O** (Page 645)  
Wenjian Kuang, Harm Tolner, Qing Li *Southeast University of China*  
Wen Pan, Ninghui Wang *Dalian University of Technology*

#### Session 45: Display Manufacturing: Substrates

- 45.1: **Manufacturing an Ultra Slim LCD: The Strategy and Process** (Page 649)  
Wei-Chieh Yang, Wei-Yi Chien, Maw-Song Chen, Wei-Ming Huang *AU Optronics Corporation*
- 45.2: **Two Point Bending of Thin Glass Substrate** (Page 652)  
Suresh T. Gulati, Jamie Westbrook, Stephen Carley, Hemanth Vepakomma, Toshihiko Ono *Corning Incorporated*
- 45.3: **Thin LCD Substrates Reduce Edge Light Mura** (Page 655)  
Raymond G. Greene, Cynthia C. Contreras, Clive Gierbolini, Robert S. Schweiger, Tina M. Proulx *Corning Incorporated*
- 45.4: **Advanced Grinding Development for Laminated TFT-LCDs** (Page 659)  
Chih-Hsiao Tseng, Yu-Chen Liu, Mao-Song Chen, Tom Huang *AU Optronics Corporation*

#### Session 46: Local Dimming

- 46.1: **Directivity Enhanced BLU for Edge-Type Local Dimming** (Page 662)  
YoungChan Kim, HyunDeok Im, MoonGyu Lee, HwanYoung Choi *Samsung Electronics*
- 46.2: **System Architecture and FPGA- Implementation of the SSC Local Dimming Processor for an Edge-Lit Serial TV** (Page 665)  
Tobias Jung, Marc Albrecht, Daniel Schäfer, Chihao Xu *Saarland University*
- 46.3: **Ultra Wide-Gamut LCD Using a Local Multi-Spectral Backlight** (Page 669)  
Karel J. G. Hinnen, Erno H. A. Langendijk, Martin Hammer *Philips Consumer Lifestyle*
- 46.4: **Pixel-Wise Intensity Compensation for Locally Dimmed Backlight Displays Based on an Objective Metric** (Page 673)  
H. Emrah Tasli *ODTÜ*



## Session 47: Laser Light Projection

- 47.1: **Invited Paper: Progress in Green and Blue Laser Diodes and Their Application in Pico Projection Systems** (Page 677)  
James W. Raring, Mathew C. Schmidt, Christiane Poblentz, Mark J. Mondry, Paul Rudy, James S. Speck, Steven P. DenBaars, Shuji Nakamura *Soraa, Inc.*
- 47.2: **Solid-State Lasers Emitting at Red, Green, and Orange Wavelengths for Projection Applications** (Page 681)  
Ulrich Weichmann, Uwe Mackens, Holger Moench *Philips Research Laboratories*
- 47.3: **Invited Paper: Recent Progress in Direct Green Lasers for Mobile Image Projectors** (Page 685)  
Adrian Avramescu, Teresa Lerner, Christoph Eichler, Georg Bruederl, Jens Müller, Sönke Tautz, Stephan Lutgen, Uwe Strauss *OSRAM Opto Semiconductors GmbH*
- 47.4: **1 Watt Compact Green Laser for Projection Displays** (Page 689)  
Yi Gan, Lu Yang *McMaster University*  
Qingyang Xu, Changqing Xu *McMaster University*

## Session 48: Novel 3D Displays

- 48.1: **Distinguished Student Paper: A Depth-Fused Multi-Focal-Plane Display Prototype Enabling Focus Cues in Stereoscopic Displays** (Page 691)  
Xinda Hu, Hong Hua *The University of Arizona*
- 48.2: **Invited Paper: A Stereoscopic Display System for Medical Microsurgery that Utilizes a Small-Sized High-Resolution Field Sequential Color LCD** (Page 695)  
Kazuhiro Wako, Kazuo Sekiya, Hiroshi Murai, Tadashi Kishimoto, Shigeru Nakano *Aomori Support Center for Industrial Promotion*  
Ryo Mochizuki *Mitaka Kohki Co., Ltd.*  
Takahiro Ishinabe, Tetsuya Miyashita, Yoshito Suzuki, Tatsuo Uchida *Tohoku University*
- 48.3: **A Novel Touchable Floating Color Omnidirectional-view Three Dimensional Display** (Page 699)  
Xinxing Xia, Caijie Yan, Zhenrong Zheng, Haifeng Li, Xu Liu *Zhejiang University*
- 48.4: **Beam Forming for a Laser Based Auto-stereoscopic Multi-Viewer Display** (Page 702)  
Hadi Baghsiahi, David R. Selviah, Eero Willman, Anibal Fernández, Sally E. Day *University College London*  
Kaan Akşit, Selim Ölçer, Aref Mostafazadeh, Eedem Erden, Velichappattu C. Kishore, Hakan Urey *Koç University*  
Phil A. Surman *De Montfort University*
- 48.5: **Illumination Sensitive Three-Dimensional Display** (Page 706)  
Jisoo Hong *Seoul National University*  
Keehoon Hong *Seoul National University*  
ByoungHo Lee *Seoul National University*

## Session 49: OLED Displays II

- 49.1: **Invited Paper: Emergent Oxide TFT Technologies for Next-Generation AMOLED Displays** (Page 710)  
Toshiaki Arai, Tatsuya Sasaoka *Sony Corporation*
- 49.2: **Invited Paper: A Transparent AMOLED with On-Cell Touch Function Driven by IGZO Thin-Film Transistors** (Page 714)  
Hsing-Hung Hsieh, Tsung-Ting Tsai, Chen-Ming Hu, Chia-Ling Chou, Shih-Feng Hsu, Yuan-Chun Wu, Ching-Sang Chuang, Lee-Hsun Chang, Yusin Lin *AU Optonics Corporation*
- 49.3: **Oxide TFT Scan Driver with Dynamic Threshold Voltage Control** (Page 718)  
Yong-Sung Park, Bo-Yong Chung, Chul-Kyu Kang, Seoung-Il Park, Ki-Ju Im, Jong Han Jeong, Byung-Hee Kim, Sang-Soo Kim *Samsung Mobile Display Co., Ltd.*
- 49.4: **High-Definition Top-Emitting AMOLED Display with Highly Reliable Oxide Semiconductor Field Effect Transistors** (Page 722)  
Nozomu Sugisawa, Toshiki Sasaki, Takahiro Ushikubo, Nobuharu Ohsawa, Satoshi Seo, Kaoru Hatano, Tkaaki Nagata, Shuji Fukai, Tsutomu Murakawa, Shuhei Yoshitomi, Masahiko Hayakawa, Hiroyuki Miyake, Jun Koyama, Shunpei Yamazaki *Semiconductor Energy Laboratory Co., Ltd.*  
Kenichi Okazaki, Masayuki Sakakura *Advanced Film Device Inc.*

## Session 50: Optical Touch Systems

- 50.1: **Invited Paper: (PSD) A New Method for Optical Touch Screens** (Page 726)  
Ola Wassvik, Tomas Christiansson, Thomas Craven-Bartle, Mats-Petter Wallander  
*FlatFrog Laboratories AB*
- 50.2: **High Reliable In-Ga-Zn-Oxide FET Based Electronic Global Shutter Sensors for In-Cell Optical Touch Screens and Image Sensors** (Page 729)  
Hikaru Tamura, Toshiki Hamada, Takashi Nakagawa, Takeshi Aoki, Masataka Ikeda, Munehiro Kozuma, Yoshiyuki Kurokawa, Takayuki Ikeda, Koji Moriya, Yoshiharu Hirakata, Nozomi Kamata, Tsutomu Murakawa, Jun Koyama, Shunpei Yamazaki  
*Semiconductor Energy Laboratory Co., Ltd.*  
Katsuaki Tochibayashi, Kenichi Okazaki, Masayuki Sakakura *Advanced Film Device Inc.*
- 50.3: **Novel Write-erasable Input Display with Memory Circuits and Photo-Sensors** (Page 733)  
Satoshi Maruyama, Takahiko Endo, Kenji Harada, Hirotaka Hayashi, Hideki Mine, Hiroyuki Kimura, Masaki Kinoshita, Hiroki Nakamura *Toshiba Mobile Display Co., Ltd.*
- 50.4: **A Virtual Touch 3D Interactive Display with Embedded Optical Sensor Array for Five-Axis (x, y, z,  $\theta$ ,  $\Phi$ ) Detection** (Page 737)  
Guo-Zhen Wang, Ming-Ching Ma, Shang-Yu Tung, Yi-Pai Huang *National Chiao Tung University*  
Hung-Wei Tseng, Jui-Chi Lo, Chung-Hong Kuo *AU Optronics Corporation*

## Session 51: High-Efficiency Plasma TVs

- 51.1: **Invited Paper: High Luminous Efficacy and Low Power Consumption Plasma TV** (Page 741)  
Sang-Koo Kwon, Sung-Soo Yang, Jee-Hoon Kim, Byung-Ho Ha, Chang-Hwan Bae, Ju-Won Seo, Ji-Won Woo, Jung-Sik Ahn, Yoon-Lae Cho, Yun-Kwon Jung, Suk-Gwon Choi  
*LG Electronics Inc.*
- 51.2: **Invited Paper: Improvement of Luminous Efficiency Using a New Cell Structure in ACP-DPs** (Page 745)  
Shinichiro Hori, Tomohiro Murakoso, Eishirou Otani, Kimio Amemiya *Panasonic Plasma Display Corporation*  
Ryuichi Murai *Panasonic AVC Networks*
- 51.3: **Highly Reliable Modeling of AC Plasma Display Panels with a Three-Dimensional Hybrid Simulation** (Page 748)  
Seung Bo Shim, In Cheol Song, Ho-Jun Lee, Hae June Lee *Pusan National University*  
Min Sup Hur *Ulsan National Institute of Science and Technology*
- 51.4: **Mechanism of Luminous Efficiency Improvement of High  $\gamma$  and High Xe Discharge** (Page 752)  
Di Zhu *Southeast University & Hiroshima University*  
Xiong Zhang *Southeast University*  
Hiroshi Kajiyama *Hiroshima University*  
Tomoaki Izumi, Toshiyuki Akiyama *Advanced PDP Development Center Corporation*

## Session 52: Display Manufacturing and Applications: Modules and Components

- 52.1: **A Study of Electrostatic Mura Specified for IPS LCD** (Page 756)  
Sung-hoe Yoon, Soho Kim, A-Jung Song, Ji-Yun Jang, Eun-Jung Kim, Byeong-Koo Kim, Ji-Soo Kim, Jae-ha Choi, Hee-Young Song, Seok-Ryoul Lee *LG Display*
- 52.2: **Edge-Type LED Module Mura Analysis and Improvement** (Page 758)  
Chi-Chen Huang, Hung-Ling Yang, Alex Tzeng *AU Optronics Corporation*
- 52.3: **A Use of Electrically Conductive Oxide Ceramic ( $12\text{CaO}\cdot 7\text{Al}_2\text{O}_3$  Electride) Electrode Having Low Work Function and Low Sputtering Yield for Fluorescent Lamps** (Page 762)  
Naomichi Miyakawa, Toshinari Watanabe, Satoru Watanabe, Kazuhiro Ito *Asahi Glass Co., Ltd.*  
Setsuro Ito, Hideo Hosono *Tokyo Institute of Technology*  
Shigeo Mikoshiba *The University of Electro-Communications*
- 52.4: **Proposal of Zero-Birefringence Pressure Sensitive Adhesives for Preventing the Light Leakage of LCDs** (Page 766)  
Hiroto Ito, Satoshi Yanai, Akihiro Tagaya, Yasuhiro Koike *Keio University*  
Sumihisa Oda *Saiden Chemical Industry Co., Ltd.*

- 52.5: **Broadband Anti-Reflection (BBAR) Nanostructure Contrast Enhancement (NCEF) Films for Electronic Optical Display Applications** (Page 770)  
Kalc C. Vang, Ta-Hua Yu, Moses David *3M Company*

### Session 53: LED and Laser Backlights

- 53.1: **Invited Paper: Recent Trend of LED Backlight with Local Dimming and its Application for Multi-Primary-Color Displays** (Page 773)  
Yasuhiro Yoshida, Katsuya Otoi, Tomohiko Mori, Kazunari Tomizawa *Sharp Corporation*
- 53.2: **A Novel Optical System LED-Backlight with Excellent Brightness Uniformity for TFT-LCD** (Page 777)  
Takafumi Kokusho, Yasuhiro Morii, Akihiro Mori, Yuji Tsuchiyama, Seiji Sakai, Tetsuya Satake, Akimasa Yuuki, Kenji Itoga, Naoko Iwasaki *Mitsubishi Electric Corporation*
- 53.3: **New Light-Bar Emitting Phosphor-Converted White Line Light Pumped by InGaN/GaN Laser Diode for Edge-Lit Backlight Unit Applications** (Page 781)  
Junichi Kinoshita, Yoji Kawasaki, Yuji Takeda, Misaki Ueno *Harison Toshiba Lighting Corporation*
- 53.4: **Highly Polarized Backlight Consisting of an Aperture-Limited Light Guide Plate and a Hybrid Wire-Grid Polarizer** (Page 785)  
Chi-Jui Chung, Po-Hung Yao, Cheng-Huan Chen *National Tsing Hua University*

### Session 54: Solid-State Lighting Applications

- 54.1: **Invited Paper: Trends in LED Illumination and Display Backlighting** (Page 789)  
Willem Sillevs Smitt *Philips Lumileds Lighting*
- 54.2: **Bidirectional LCD Monitor Using Single Backlight Unit** (Page 793)  
JaeJung Han, Daeil Kang, Seoggyu Byun, Jeongmin Moon, Jaewon Lee *LG Display*
- 54.3: **Cluster LED Spectral Optimization as Lens Design** (Page 797)  
Ming-Chin Chien, Chung-Hao Tien *National Chiao Tung University*
- 54.4: **Zoomable LED Spot Light with High Angular Beam Sharpness** (Page 801)  
Huan-Ping Chiu, Kuan-Yu Chen, Yao-Chien Cheng, Alex Wang *Chilin Technology Co., Ltd.*

### Session 55: Crosstalk in Stereoscopic Displays

- 55.1: **Diversity and Coherence of 3D Crosstalk Measurements** (Page 804)  
Laurent Blondé, Jean-Jacques Sacré, Didier Doyen, Quan Huynh-Thu, Cédric Thébault *Technicolor Research & Innovation*
- 55.2: **A Simulation Platform and Crosstalk Analysis for Patterned Retarder 3D Display** (Page 808)  
Chih-Yao Ma, Yu-Cheng Chang, Yi-Pai Huang *National Chiao Tung University*  
Cheng-Han Tsao *AU Optonics Corporation*
- 55.3: **Crosstalk Measurements of Shutter Glasses 3D Displays** (Page 812)  
Marcus Barkowsky *University of Nantes*  
Sylvain Tourancheau *Mid Sweden University*  
Kjell Brunnström *Acreo AB*  
Kun Wang *Mid Sweden University & Acreo AB*  
Börje Andrén *Acreo AB*
- 55.4: **Image Processing-based Crosstalk Reduction for Stereoscopic Displays with Shutter Glasses** (Page 816)  
Yuki Iwanaka, Takeshi Mita, Masahiro Baba *Toshiba Corporation*

### Session 56: OLED Devices I

- 56.1: **Invited Paper: Excited State Interactions in P-OLEDs: Implications for Efficiency and Lifetime** (Page 820)  
Matthew Roberts, Simon King, Michael Cass, Martina Pintani, Chris Coward *Cambridge Display Technology Ltd.*  
Nobuhiko Akino, Hideaki Nakajima, Makoto Anryu *Sumitomo Chemical Company Ltd.*
- 56.2: **Analysis and Interpretation of Degradation Mechanism of OLED with p-Doping Layer** (Page 822)  
WonJun Song, SunHee Lee, Kyul Han, SungSoo Koh, IISoo Park, JiWhan Yoon, KwanHee Lee, JongHyuk Lee, SungChul Kim, ChangHee Lee *Seoul National University*
- 56.3: **Study of Space Charges in Hole Transfer Layer of OLED Devices Using Impedance**

**Spectroscopy and Transient Electroluminescence** (Page 825)

Jiyoung Choung, Joon G. Lee, Jin B. Choi, Il S. Oh, Se J. Cho, Jin Y. Yoon, Hyung J. Song, Yeon H. Lee, Chang H. Lee, Won J. Kim, Young W. Song, Jong H. Lee, Sung C. Kim *Samsung Mobile Display Co., Ltd.*

**56.4: New Deep Blue Fluorescent Materials and Their Application to High Performance OLEDs** (Page 829)

Yuichiro Kawamura, Hitoshi Kuma, Masakazu Funahashi, Masahiro Kawamura, Yumiko Mizuki, Hiroyuki Saito, Ryo Naraoka, Kazuki Nishimura, Yukitoshi Jinde, Toshihiro Iwakuma, Chishio Hosokawa *Idemitsu Kosan Co., Ltd.*

**Session 57: Touch Systems**

**57.1: Invited Paper: Novel Thin Glass for 3D Shaped Electronics Display Covers** (Page 833)

Jose Zimmer *SCHOTT AG*

**57.2: Direct Dielectric Line Printing for Touch Panel Display Jumpers Using Transparent Dielectric Inks and Aerosol Jet® Deposition Methods** (Page 837)

William Hegge, David Bohling *Optomec, Inc.*

Joe Chou *Sun Chemical*

Michael McAllister, Philippe Schottland *Sun Chemical*

**57.3: The Effect of Touch Screen Hand Stability Method on Performance & Subjective Preference in Turbulence** (Page 841)

Jeff Lancaster, Bob De Mers, Bill Rogers, Andrew Smart, Stephen Whitlow *Honeywell International*

**57.4: Invited Paper: The Breadth-Depth Dichotomy: Opportunities and Crises in Expanding Sensing Capabilities** (Page 845)

Daniel Wigdor *University of Toronto*

**Session 58: Advanced Emissive Displays**

**58.1: Invited Paper: Highly Efficient and Long Life MIM Cathodes for FEDs** (Page 849)

Toshiaki Kusunoki, Mutsumi Suzuki, Masakazu Sagawa, Etsuko Nishimura, Mitsuharu Ikeda, Yoshiro Mikami, Tatsumi Hirano, Kazutaka Tsuji *Hitachi Ltd.*

**58.2: A 34-in. Low-Work-Function Printable FED** (Page 853)

Yun Ye, Tailliang Guo, Zhixian Lin, Jintang Lin, Xiaojing Xiao *Fuzhou University*

**58.3: Invited Paper: Flexible Transparent Photoluminescent Display** (Page 855)

Cheol Jang, Sung-Min Lee, Kukjoo Kim, Sung-Il Ahn, Kyung Cheol Choi *KAIST*

**58.4: Improvement of Luminous Efficacy of Shadow Mask Plasma Display Panel** (Page 858)

Panpan Zhang, Yan Tu, Lanlan Yang, Harm Tolner *Southeast University*

**Session 59: Display Manufacturing: LTPS**

**59.1: Invited Paper: LTPS Backplane Technologies for AMLCDs and AMOLEDs** (Page 862)

Chi Woo Kim, Jin Goo Jung, Jae Beom Choi, Deok Hui Kim, Chung Yi, Hye Dong Kim, Yun Ho Choi *Samsung Mobile Display Co., Ltd.*  
James Im *Columbia University*

**59.2: Development of Ni Sputtering System for Mass Production of Large AMOLED TV Based on SGS Technology** (Page 866)

Gi-Youl Han, Kwang-Soo Ko, Mun-Sik Kim, Won-Yong Lee, Jueng-Hwan Choi, Jae-Moon Choi, Jun-Yong Lee *IRUJA Co. Ltd.*

**59.3: Bridged-Grain (BG) Eximer Laser Annealing (ELA) Polycrystalline Silicon Thin Film Transistors (TFTs)** (Page 870)

Shuyun Zhao *Hong Kong University of Science and Technology*

Zhiguo Meng *Hong Kong University of Science and Technology & Nankai University*

Wei Zhou, Man Wong, Hoi Sing Kwok *Hong Kong University of Science and Technology*

**59.4: Rapid Dehydrogenation Technology of a-Si using Xe Flash-Lamp Annealing** (Page 874)

Young Jin Chang, Jae Hwan Oh, Seong Hyun Jin, Se Hun Park, Min Hwan Choi, Won Kyu Lee, Jae Beom Choi, Hye Dong Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*

**Session 60: Integrated Optics for Backlights**

**60.1: LCD Integrated Optics** (Page 878)

John Wheatley, Tao Liu, Matthew E. Sousa, Stephen Etzkorn, Ellen Bösl, John Van Derlofske, Quinn Sanford, C. David Hoyle, Gilles Benoit *3M Company*

- 60.2: **A Polarized Laser Backlight Using a Polymer Free of Orientational and Photoelastic Birefringence** (Page 882)  
Takahiro Kurashima, Akihiro Tagaya, Yasuhiro Koike *Keio University*
- 60.3: **A Novel Backlight System with High On-axis Luminance and Small Viewing Angle** (Page 886)  
Chen-Wei Fan, Jui-Wen Pan *National Chiao Tung University*  
Sheng-Han Tu *Genesis Photonics Inc.*
- 60.4: **Distinguished Paper: A Directional Backlight with Narrow Angular Luminance Distribution for Widening the Viewing Angle of a LCD with a Front-Surface Light-Scattering Film** (Page 890)  
K. Kälántár *Global Optical Solutions*

### Session 73: Late-News Projection

- 73.1L: **Late-News Paper: Novel Multi-View Display Using QDA Screen with Short Projection Distance by Tiled Image Method** (Page 894)  
Shiro Ozawa, Kazuyuki Iso, Yasuhiro Yao *NTT Corporation*  
Tohru Kawakami, Baku Katagiri, Yoshihito Suzuki *Tohoku University*  
Tatsuo Uchida *Tohoku University and Sendai National Colleges of Technology*
- 73.2L: **Late-News Paper: A Multi-View Projection Display** (Page 898)  
Huei Pei Kuo, Kar Han Tan, Larry Hubby, Robert Garcia, Alexander M. Bratkovsky  
*Hewlett Packard Company*
- 73.3L: **Late-News Paper: High Efficiency LED Illuminator for 2D/3D Switchable LCoS Projection Display** (Page 901)  
Sheng-Hsun Hsieh, Cheng-Huan Chen *National Tsing Hua University*
- 73.4L: **Late-News Paper: Miniature, Highly Efficient, and Low Cost Green Laser Source for Pico-Projectors** (Page 904)  
Stepan Essaian, John Khaydarov, Slav Slavov *Spectralus Corporation*  
Gevorg Gabrielyan, Armen Poghosyan, Suren Soghomonyan *Spectralus CJSC*  
Changyeoung Kim *Advanced Media Lab, SAIT, Samsung Electronics*

### Session 61: 3D Human Factors: Applied Vision

- 61.1: **Control of Subjective Depth in Stereoscopic Motion Pictures by Quantified Aerial Perspective** (Page 908)  
Shuichi Takahashi, Yasuhide Hyodo, An-Pang Lin, Isao Ohashi, Yoshihide Shimpuku  
*Sony Corporation*  
Kazuya Matsubara, Kazumichi Matsumiya, Satoshi Shioiri *Tohoku University*
- 61.2: **The 3D Image Quality Index ( $\Delta X_{3D}$ ) Including Crosstalk, Motion Blur, and Disparity for Two-View Stereoscopic Images** (Page 912)  
Yu-Yi Chien, Yu-Cheng Chang, Yi-Pai Huang *National Chiao Tung University*
- 61.3: **Stereoscopic 3D Content Depth Tuning Guided by Human Visual Models** (Page 916)  
Chang Yuan, Hao Pan, Scott Daly *Sharp Laboratories of America*
- 61.4: **Active Crosstalk Reduction on Multi-View Displays Using Eye Detection** (Page 920)  
Juyong Park, Dongkyung Nam, Geeyoung Sung, Yuntae Kim, Dusik Park, Changyeoung Kim *Samsung Electronics*

### Session 62: OLED Devices II

- 62.1: **High-Performance Solution-Processed OLED Enhanced by Evaporated Common Layer** (Page 924)  
Toshiki Matsumoto, Tadahiko Yoshinaga, Tomoyuki Higo, Toshiaki Imai, Takashi Hirano, Tatsuya Sasaoka *Sony Corporation*
- 62.2: **Development of Polymer Light-Emitting Diode (PLED) Displays Using the Relief Printing Method** (Page 928)  
Jun Onohara, Keisuke Mizuno, Yuji Kubo, Eiichi Kitazume *Toppan Printing Co., Ltd.*
- 62.3: **Fundamental Issues with IJP P-OLED Devices: Identification and Corrective Actions** (Page 932)  
Ilaria Grizzi, Mark Crankshaw, Daniel Forthsythe, Gary Williams *Cambridge Display Technology, Ltd.*
- 62.4: **Hybrid Polymer-OLEDs with Doped Small-molecule Electron-Transport Layers for Display Applications** (Page 935)  
Ulrich Denker, Tobias W. Canzler, Jan Birnstock *Novald AG*  
Ilaria Grizzi, Oscar Fernandez, Graham Anderson, Elliot Spain *Cambridge Display*

### Session 63: Liquid-Crystal Alignment I

- 63.1: **Invited Paper: Liquid Crystal Devices Based on Photoalignment and Photo-Patterning Materials** (Page 939)  
Vladimir Chigrinov, Hoi Sing Kwok *Hong Kong University of Science and Technology*  
Isa Nishiyama, Hirohi Hasebe, Haruyoshi Takatsu *Dainippon Ink and Chemicals Inc.*
- 63.2: **Pre-Tilt Alignment Technique via Photo-Reactive Side Chains on PI Layer for VA LCD** (Page 942)  
Kai-Xian Yang, Jan-Tien Lien *Chunghwa Picture Tubes, Ltd.*
- 63.3: **Fast Switching Surface-Polymer-Assisted IPS Liquid Crystal Displays** (Page 945)  
Jeoung-Yeon Hwang, Liang-Chy Chien *Kent State University*
- 63.4: **Photocopy Technology in Producing Patterned Alignment Layer** (Page 948)  
Tao Du, Fan Fan, Qi Guo, Vladimir Chigrinov, Hoi Sing Kwok *Hong Kong University of Science and Technology*

### Session 64: Display Measurement Standards and Applications

- 64.1: **Invited Paper: The New Information Display Measurements Standard - A Display Metrology Document** (Page 950)  
Edward F. Kelley *KELTEK, LLC*
- 64.2: **MEMs-Based Reflective Display Measurements in Ambient Use Conditions** (Page 954)  
Thomas G. Fiske *Qualcomm MEMS Technologies, Inc.*
- 64.3: **Flicker Visibility: A Perceptual Metric for Display Flicker** (Page 957)  
Andrew B. Watson, Albert J. Ahumada *NASA Ames Research Center*

### Session 65: Field-Sequential Color

- 65.1: **Color Breakup Reduction by Local-Primary-Desaturation in Color-Filterless LCDs** (Page 960)  
Fang-Cheng Lin *Philips Research Laboratories & National Chiao Tung University*  
Yuning Zhang *Philips Research Laboratories & Southeast University*  
Erno H. A. Langendijk *Philips Research Laboratories*
- 65.2: **A 120 Hz Spatio-Temporal Color Display without Color Breakup** (Page 964)  
Yuning Zhang *Southeast University & Philips Consumer Lifestyle*  
Erno H. A. Langendijk, Martin Hammer *Philips Consumer Lifestyle*  
Fang-cheng Lin *Philips Consumer Lifestyle & National Chiao Tung University*
- 65.3: **Stencil Field-Sequential-Color Method on Locally Controlled Side-Lit Eco-LCDs** (Page 968)  
Chang-I Teng, Fang-Cheng Lin, Yi-Pai Huang, Han-Ping David Shieh *National Chiao Tung University*

### Session 66: OLED Lighting I

- 66.1: **Invited Paper: Performance of a Large-Size White OLED for Lighting Application** (Page 972)  
Min Soo Kang, Mun Kyu Joo, Jung Hyoung Lee, Yun Hye Ham, Jung Bum Kim, Kyoung Sik Moon, Sehwon Son *LG Chem*
- 66.2: **Efficiency Enhancement in White PIN OLEDs by Simple Internal Outcoupling Methods** (Page 975)  
Tobias W. Canzler, Sven Murano, Domagoj Pavicic, Omrane Fahdel, Carsten Rothe, Andreas Haldi, Michael Hofmann, Qiang Huang *Novaled AG*
- 66.3: **Hybrid White OLEDs for General Lighting** (Page 979)  
Peter Loebel, Claudia Goldmann, Volker van Elsbergen, Stefan Grabowski, Herbert Boerner, Dietrich Bertram *Philips Technologie GmbH*
- 66.4: **Invited Paper: Challenges and Opportunities in Scaling Up OLED Lighting Devices** (Page 983)  
Ruiqing Ma, Peter A. Levermore, Huiqing Pang, Prashant Mandlik, Kamala Rajan, Jeffrey Silvernail, Mike Hack, Julie J. Brown *Universal Display Corporation*

### Session 67: 3D Human Factors and Performance

- 67.1: **Invited Paper: Performance Gains When Using 3D Displays vs. 2D Displays** (Page 987)  
John O. Merritt *The Merritt Group*

- 67.2: **Perceptual Brightness Analysis of 2D and Stereoscopic 3D Displays** (Page 991)  
Dongwook Choi, Byeonghwa Choi, Sangho Kim, Seungbae Lee, Brian H. Berkeley  
*Samsung Mobile Display Co., Ltd.*
- 67.3: **Perceptually Relevant Characterization of Stereoscopic Displays** (Page 994)  
Kees Teunissen, Aleksandar Sevo, Age van Dalssen, Hans van Parys *Philips Consumer Lifestyle*
- 67.4: **Measurement and Characterization of Autostereoscopic 3D Display: A New Analytical Method** (Page 998)  
Sheng-Chi Liu, Che-Wei Chang *Chunghwa Picture Tubes, Ltd.*

## Session 68: OLED Physics

- 68.1: **Capacitance-Voltage Characteristics of Top-Emitting Organic Light Emitting Diodes for Mobile Display Application** (Page 1002)  
Jaewon Lee, Kang-Ju Lee, Min-ki Kim, Jong-sung Kim, Choong-keun Yoo, Hyong-Yoon Oh, Sooyoung Yoon, Chang-Dong Kim, Yong-Kee Hwang *LG Display*
- 68.2: **Using Rigorous Electromagnetic Analysis in Modeling OLEDs with Gratings** (Page 1006)  
Wen-Lan Yeh, Yih-Peng Chiou *National Taiwan University*  
Chun-Liang Lin, Chieh-Wei Chen, Chung-Chun Lee *AU Optronics Corporation*
- 68.3: **Achieving a High-Efficiency White Organic Light-Emitting Diode Based on Transient Electroluminescence Analysis** (Page 1010)  
Yi-Hsin Lan, Chih-Hung Hsiao, Jiun-Haw Lee *National Taiwan University*

## Session 69: Liquid-Crystal Alignment II

- 69.1: **The Method and Mechanism of Optimizing Optical Performances of Polymer-Stabilized Liquid Crystals Panels** (Page 1013)  
Kuo-Hua Wu, Wei-Chieh Yang, Ping-Chun Liang, Maw-Song Chen, Wei-Ming Huang *AU Optronics Corporation*
- 69.2: **Novel Viewing Angle Control Technology with Single-Cell LCD** (Page 1016)  
Chih-Hsiang Yang, Chao-Wei Yeh, Chien-Huang Liaw, Wen-Hao Hsu, Jenn-Jia Su *AU Optronics Corp.*
- 69.3: **Spontaneously Formed Dual Groove Structure for Control of Azimuthal Anchoring and Pretilt in Liquid Crystal Alignment** (Page 1019)  
Chang-sub Park, Yeonjeong Han, Kyung-Il Joo, Ji-Sub Park, Min-Kyu Park, Shin-Won Kang, Hak-Rin Kim *Kyungpook National University*
- 69.4: **High Speed In-Plane Switching LCD with Free Retardation** (Page 1022)  
Joun-Ho Lee, Byeong-Koo Kim, Hyun-Chul Choi *LG Display*  
Wan Seok Kang, Gi-Dong Lee *Dong-A University*

## Session 70: Achieving Accurate Color Reproduction

- 70.1: **Distinguished Paper: Achieving High Color Reproduction Accuracy in LCDs for Color-Critical Applications** (Page 1026)  
Louis D. Silverstein *VCD Sciences, Inc.*  
Syed F. Hashmi *University of Arizona*  
Karl Lang *Lumita, Inc.*  
Elizabeth A. Krupinski, William Dallas, Hans Roehrig *University of Arizona*
- 70.2: **Virtual Display: A Platform for Evaluating Color Calibration Kits** (Page 1030)  
Wei-Chung Cheng, Aldo Badano *US Food and Drug Administration*
- 70.3: **Precise Evaluation of the Colorimetric Properties of Displays versus Viewing Angle Using Fourier Optics** (Page 1034)  
Pierre Boher, Thierry Leroux, Thibault Bignon, Véronique Collomb-Patton *ELDIM*
- 70.4: **Optical Characterization of Scattering Anti-Glare Layers** (Page 1038)  
Michael E. Becker *Display-Metrology & Systems*  
Juergen Neumeier *Autronic-Melchers GmbH*

## Session 71: Novel Displays

- 71.1: **Development of Micro-Pixelated GaN LED Array Micro-display System** (Page 1042)  
Cheng-Wei Sun, Chia-Hsin Chao, Heng-Yin Chen, Yung-Hsiang Chiu, Wen-Yung Yeh, Ming-Hsien Wu, His-Hsuan Yen, Chao-Chiun Liang *Industrial Technology Research Institute*

- 71.2: **Color Displays Using Reconfigurable Liquid Droplets** (Page 1046)  
Su Xu, Hongwen Ren, Yifan Liu, Shin-Tson Wu *University of Central Florida*
- 71.3: **Flat-Panel-Display System Based on Interference Modulation for Both Intensity and Color** (Page 1049)  
Yuye Ling, Weilu Gao, Shihong Ouyang, Guoen Liang, Yikai Su, Han-Ping D. Shieh  
*Shanghai Jiao Tong University*
- 71.4: **Invited Paper: Imaging via Backlights** (Page 1052)  
Adrian Travis, Neil Emerton, Tim Large, Liying Chen, Steven Bathiche *Microsoft Corporation*

## Session 72: OLED Lighting II

- 72.1: **Invited Paper: High Performance White OLEDs for Next Generation Solid State Lightings** (Page 1056)  
Takuya Komoda, Hiroya Tsuji, Kazuyuki Yamae, Kittichungchit Varutt, Yuko Matsuhisa, Nobuhiro Ide *Panasonic Electric Works Co., Ltd*
- 72.2: **Phosphorescent OLEDs: Enabling Solid State Lighting with Lower Temperature and Longer Lifetime** (Page 1060)  
Peter A. Levermore, Alexey B. Dyatkin, Zeinab M. Elshenawy, Huiqing Pang, Raymond C. Kwong, Ruiqing Ma, Michael S. Weaver, Julie J. Brown *Universal Display Corporation*
- 72.3: **Large-area OLED Lighting Panel with Good Optical Performance** (Page 1064)  
Chun-Liang Lin, Meng-Ting Lee, Chieh-Wei Chen, Chung-Chun Lee *AU Optronics Corporation*
- 72.4: **Invited Paper: Novel Approaches for OLED Lighting** (Page 1067)  
Karl Leo, Patricia Freitag, Simone Hofmann, Mauro Furno, Thomas C. Rosenow, Sebastian Reineke, Björn Lüssem *TU Dresden*  
Stefan Mogck *Fraunhofer Institute for Photonic Microsystems*  
Tomasz Wanski *TU Dresden & Fraunhofer Institute for Photonic Microsystems*  
Christian May *Fraunhofer Institute for Photonic Microsystems*  
Karl Leo *TU Dresden & Fraunhofer Institute for Photonic Microsystems*





May 17-20, 2011  
Los Angeles Convention Center  
Los Angeles, California USA  
[www.sid2011.org](http://www.sid2011.org)

## VOLUME 3 Table of Contents: Poster Session

### 3D

- P-1: An Integral Imaging Display With Wide Viewing Angle** (Page 1095)  
Huan Deng, Qiong-Hua Wang, Da-Hai Li, Fang-Ning Wang *Sichuan University*
- P-2: Cross-Talk Caused by Light Reflected on the Back Face of the LCD Glass in an Auto-stereoscopic Display Using the Field-Sequential Method and a Directional Backlight System** (Page 1098)  
Akinori Hayashi, Akira Sakai, Tomohiro Kometani, Hiroshi Ito *Eizo Nanao Corporation*
- P-3: Crosstalk Visibility in Stereoscopic Displays** (Page 1102)  
Dong-Hoon Kang, Kyung-Sung Bae, Gi-Cheon Yoon *Samsung Electronics Co., Ltd.*  
Jang-Kun Song *SungKyunKwan University*
- P-4: Measurement and Analysis of a Novel Full-Parallax Three-Dimensional Display System** (Page 1105)  
Yifan Peng, Haifeng Li, Shuai Li, Xu Liu *Zhejiang University*
- P-5: A High-Resolution Multi-View 2D/3D Display with HxDP Arrangement and Its Optical Characterization** (Page 1109)  
Koji Shigemura, Shinya Niioka, Kazunori Masumura, Hideki Asada *NEC LCD Technologies, Ltd.*
- P-6: Improvement in the 3D Image Crosstalk on Double-Layer Liquid-Crystal 3D Display** (Page 1113)  
Shih-Chieh Lin, Hsiang-Tan Lin, Chun-Chieh Chiu *Chunghwa Picture Tubes, Ltd.*
- P-7: Multilayered Integral Imaging with Improved Image Clarity** (Page 1116)  
Yukio Ueda, Hideki Kakeya *University of Tsukuba*
- P-8: Analysis of Temperature Dependence of 3D Viewing Space for Autostereoscopic Displays** (Page 1120)  
Di Wu, Michiaki Sakamoto, Koji Shigemura, Hideki Asada *NEC LCD Technologies, Ltd.*
- P-9: Extended Fractional View Integral Imaging Using Slanted Fly's Eye Lens** (Page 1124)  
Kazuhisa Yanaka, Kazutake Uehira *Kanagawa Institute of Technology*
- P-201L: Late-News Poster: A Large-Sized Directional LED Backlight Unit with a Hollow-Cavity Light Guide** (Page 1128)  
Chih-Chieh Kang, Jeng-Feng Lin, Hong-Ze Li, Shi-Fu Zeng *Southern Taiwan University*

### Active-Matrix Devices

- P-10: Design for AMOLED Display with Improved Uniformity and a Smaller Bezel** (Page 1132)  
Jin Huh, Se-Won Wang, Gyu-Hyeong Cho *KAIST*

Youngju Park, Jungchul Kim *LG Display*

- P-11: Electrical Properties and Stability of Dual-Gate Coplanar Homojunction Amorphous Indium-Gallium-Zinc-Oxide Thin-Film Transistor** (Page 1136)  
Gwanghyeon Baek, Alex Kuo, Jerzy Kanicki *University of Michigan*  
Katsumi Abe, Hideya Kumomi *Canon Inc.*
- P-12: WITHDRAWN**
- P-13: A Full-Swing a-IGZO TFT-Based Inverter with a Top Gate-Induced Depletion Load** (Page 1144)  
Min Hyuk Choi, Man Ju Seok, Mallory Mativenga, Di Geng, Dong Han Kang, Jin Jang *Kyung Hee University*
- P-14: High Performance Solution-Processed IGZO TFTs Formed by Using a High-Pressure Annealing Method** (Page 1148)  
You Seung Rim, Dong Lim Kim, Woong Hee Jeong, Hyun Soo Shin, Hyun Jae Kim *Yonsei University*
- P-15: Bias Stress Reliability for w/ and w/o Oxide-Passivated IGZO TFTs** (Page 1151)  
Chun-Hao Tu, Wei-Ting Lin, Chia-Hsiang Chen, Ming-Chin Hung, Jiun-Jye Chang, Ming-Feng Chiang, Wei-Lung Liao *AU Optronics Corporation*
- P-16: Light-Bias Induced Instability and Persistent Photoconductivity in In-Zn-O/Ga-In-Zn-O Thin Film Transistors** (Page 1154)  
Khashayar Ghaffarzadeh, Sungsik Lee, Arokia Nathan *University College London*  
John Robertson *Cambridge University*  
Sanghun Jeon, Sangwook Kim, Changjung Kim, U-In Chung *Samsung Advanced Institute of Technology*  
Je-Hun Lee *Samsung Electronics Corporation*
- P-17: Body Voltage Modulation for High Performance a-IGZO TFT and Its Application on New Inverter Structure** (Page 1158)  
Hsiao-Wen Zan, Wei-Tsung Chen, Hsiu-Wen Hsueh, Chun-Cheng Yeh, Chuang-Chuang Tsai, Hsin-Fei Meng *National Chiao Tung University*  
Chia-Chun Yeh, Ted-Hong Shinn *E Ink Holdings Inc.*
- P-18: Integration of Surface State and Geometry Effects on High Performance Amorphous IGZO Thin-Film Transistors** (Page 1162)  
Li-Wei Liu, Yun-Chu Tsai, Po-Tsun Liu, Han-Ping D. Shieh *National Chiao Tung University*
- P-19: Effect of Back Channel Passivation on the Operation Stability of Solution-Processed Transparent Oxide TFTs and Ring Oscillators** (Page 1166)  
Yong-Hoon Kim, Min Suk Oh *Korea Electronics Technology Institute*  
Kwang Ho Kim, Hyun Jae Kim *Yonsei University*  
Jeong-In Han *Dongguk University-Seoul*  
Sung Kyu Park *Chonbuk National University*
- P-20: Highly Stable Amorphous Indium Gallium Zinc Oxide with N<sub>2</sub>O Plasma Treatment** (Page 1170)  
Hoon Yim *LG Display R&D Center*  
Dae-Hwan Kim, SeungChan Choi, Byung Gook Choi, Sul Lee, Sung Ki Kim, Kwon-Shik Park, Jong-Uk Bae, Chang-Dong Kim, Myungchul Jun, Yong Kee Hwang *LG Display*
- P-21: Moved to Paper 15.4**
- P-22: Realizing a New Pixel Circuit Design for Alleviating OLED Degradation in a 2.4 inch AMOLED Panel** (Page 1173)  
Kuei-Yu Lee, Jui-Hsin Chang, Paul C.-P. Chao, Chiu-Hao Chen *National Chiao Tung University*  
Zon-Tim Tsai, Hong-Shen Lin, Lee-Hsun Chang, Yu-Sin Lin *AU Optronics Corporation*
- P-23: The Contact Properties and TFT Structures of a-IGZO TFTs Combined with Cu-Mn Alloy Electrodes** (Page 1177)  
Pil Sang Yun, Mayumi Naito, Ryo Kumagai, Yuji Sutou, Junichi Koike *Tohoku University*
- P-24: Low Power a-Si:H TFT Gate Driver Circuit Employing Negative Turn Off Biasing** (Page 1181)  
JaeHoon Lee, YuHan Bae, WheeWon Lee, YoungSoo Kim, JunYong Song, YouMee Hyun, DucHan Cho, SungMan Kim, YeongKeun Kwon, MinSung Kwon, SeungHwan Moon, Kyeong-Hyeon Kim *Samsung Electronics*
- P-25: A 2-inch AMOLED Display Using In-Zn-O TFTs with Anodized Al<sub>2</sub>O<sub>3</sub> Gate Insulator** (Page 1185)  
Linfeng Lan, Miao Xu, Min Li, Hua Xu, Dongxiang Luo, Ruixia Xu, Jianhua Zou, Hong Tao, Junbiao Peng, Lei Wang *South China University of Technology*

- P-26: Novel Driving Method to Reduce the Cost of Production and to Improve the Legibility of Text for Triple Rate Driving in Active Matrix Displays** (Page 1188)  
Sai Chang Yun, Min Hwa Kim, Byeong Seong So, Dae Seok Oh, Seung Ho Heo, Yong Hwa Park, You Sung Nam, Myung Chul Jun *LG Display Co., Ltd.*
- P-27: A Novel IGZO TFT Shift Register with Node-Shared Structure** (Page 1191)  
Binn Kim, Yong-Uk Lee, Min-Koo Han *Seoul National University*  
Seung Chan Choi, Yong Ho Jang, Kwon-shik Park, Chang-Dong Kim *LG Display*
- P-28: The Effect of AC Bias Frequency on Threshold-Voltage Shift of the Amorphous Oxide TFTs** (Page 1195)  
Sun-Jae Kim *Seoul National University*  
Young-Wook Lee *Seoul National University & Samsung Electronics*  
Soo-Yeon Lee, Jong-Suk Woo, Jang-Yeon Kwon, Min-Koo Han *Seoul National University*  
Woo-Geun Lee, Kap-Soo Yoon *Samsung Electronics*
- P-29: A Novel Six-Mask Process for High-Performance  $\mu\text{-Si}$  TFT Using Indirect Thermal Crystallization** (Page 1198)  
Jun Hyeon Bae, Hong Koo Lee, Byung Kook Choi, Sul Lee, Ki Tae Kim, Sung Ki Kim, Kwon-Shik Park, Jong Uk Bae, Chang-Dong Kim, Myung Chul Jun *LG Display R&D Center*
- P-30: Artificial Retina using Poly-Si Thin-Film Transistors Driven by Wireless Power Supply** (Page 1201)  
Mutsumi Kimura *Ryukoku University & High-Tech Research Center*  
Yuta Miura *Nara Institute of Science and Technology*  
Tomohisa Hachida *Nara Institute of Science and Technology*
- P-31: A New Driving Method for Data Line Reduction in WUXGA TFT-LCD** (Page 1205)  
Jae Young Oh, Dong Su Shin, Jae Kyun Lee, Woo sup Shin, Mike Jun, Yong Kee Hwang *LG Display*
- P-32: Improving Reliability of IGZO TFTs via the Front-channel and Back-channel Protecting Layers Method** (Page 1208)  
Chung-Tao Chen, Shin-Shueh Chen, Wu-Hsiung Lin, Po-Hsueh Chen *AU Optronics Corporation*
- P-33: Impact of  $\text{TiO}_2$  Incorporation into the Structural and Electrical Properties of Sputtered Indium Tin Oxide Field Effect Transistors** (Page 1212)  
Ji-In Kim, Kwang Hwan Ji, Jae Kyeong Jeong, Hoichang Yang *Inha University*
- P-34: Active Matrix Programmable Monolithic LEDs-on-Silicon (Light-Emitting Diodes) Displays** (Page 1215)  
ZhaoJun Liu, Ka Ming Wong, Wing Cheung Chong, Kei May Lau *The Hong Kong University of Science and Technology*
- P-35: The Effects of  $\text{NiSi}_2$  Seed Control on SGS Crystallization and TFT Characteristics** (Page 1219)  
Yun Mo Chung, Ki-Yong Lee, Jinwook Seo, Minjae Chung, Byoung Keon Park, Donghyun Lee, Hye Dong Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- P-202L: Late-News Poster: Density-of-States Based Analysis on the Effect of Active Thin-Film Thickness on Current Stress-Induced Instability in Amorphous-InGaZnO AMOLED Driver TFTs** (Page 1223)  
Dongsik Kong, Hyungkwang Jung, Yongsik Kim, Minkyung Bae, Yong Woo Jeon, Sungchul Kim, Jaemam Jang, Jaehyeong Kim, Woojoon Kim, Inseok Hur, Dong Myong Kim, Dae Hwan Kim *Kookmin University*  
Byung Du Ahn, Sei Yong Park, Jun-Hyun Park, Joo Han Kim, Jaewoo Park, Je-Hun Lee *Samsung Electronics*
- P-203L: Late-News Poster: Analytical I-V and C-V Models for Amorphous-InGaZnO TFTs and Their Application to Circuit Simulations** (Page 1227)  
Minkyung Bae, Yongsik Kim, Woojoon Kim, Dongsik Kong, Hyungkwang Jung, Yong Woo Jeon, Sungchul Kim, Inseok Hur, Jaehyeong Kim, Dong Myong Kim, Dae Hwan Kim *Kookmin University*  
Sun Il Kim, Jae Chul Park, Chang-Jung Kim *Samsung Advanced Institute of Technology*  
Byung Du Ahn, Sei Yong Park, Jun-Hyun Park, Joo Han Kim, Jaewoo Park, Je-Hun Lee *Samsung Electronics*

## Applications

- P-36: Touch Panel Display Filtering for Portable Night Vision Compatible Devices** (Page 1231)  
Scott Young, Claude Gaudette, Benjamin Phipps *Wamco, Inc.*

- P-37: **Artistic LED Crystal Illuminator with Fresnel Lens** (Page 1235)  
Kun-Di Liu, Kuan-Yu Chen, Po-Sheng Fang, Yao-Chien Cheng, Alex Wang *Chilin Technology Co., Ltd.*
- P-38: **See-Through Optical Configuration with Transmitted H-PDLC** (Page 1238)  
Hai Tao Dai *Tianjin University*  
Xiao Wei Sun *Tianjin University & Nanyang Technological University*
- P-39: **Mobile Multifunctional System for Characterization of LC Cells and LC Materials** (Page 1241)  
Vladimir Valyukh *Katedralskolan & LCOptic*  
Andriy Kozachenko *LCOptic*  
Sergiy Valyukh *Linköping University*
- P-40: **Suite Mobile: A Lab for Studying Mobile Displays in Motion** (Page 1245)  
Joel Wang, Peter Liu, Wei-Chung Cheng, Aldo Badano *US Food and Drug Administration & University of Maryland*

## Applied Vision

- P-41: **Optimization of Sub-pixel Area for Multi-primary Displays Based on Preferred Image Performance** (Page 1249)  
Hui Chu-Ke, Sheng-Wen Cheng, Wei-Chieh Sun, Jian-Shen Yu *AU Optronics*
- P-42: **Evaluation of the Ability to Reproduce Preferred Colors for Mobile Displays under Ambient Illumination Condition** (Page 1253)  
Tae-Yong Park, Jun Woo Jang, Kwang-Hoon Shin, Jang Jin Yoo, Hyun-Ho Shin *LG Display*
- P-43: **High-Luminance Primary-Color Display** (Page 1257)  
Moon-Cheol Kim, Dae-Yeon Kim *Korea Polytechnic University*  
Iksoo Lee, Jaihyun Koh, Heendol Kim, Kukhwan Ahn *Samsung Electronics Co. Ltd.*
- P-44: **Color Uniformity Grade Evaluation of Electronic Displays Based on Color Contrast Sensitivity** (Page 1261)  
Toshio Asano, Yuji Takagi *Hiroshima Institute of Technology*  
Jun Yao, Wei Liu *Fast Corporation*
- P-45: **A Quality Measurement Based on Object Formation for 3D Contents** (Page 1265)  
Chung-Te Li, Yen-Chieh Lai, Chien Wu, Chao-Chung Cheng, Liang-Gee Chen *National Taiwan University*
- P-46: **A Color Space Derived from CIELUV for Display Color Management** (Page 1269)  
Senfar Wen *Chung Hua University*
- P-47: **3D Comfort and Fusion Limits: Subjective Results versus Psychovisual Model Predictions** (Page 1273)  
Sachin G. Deshpande *Sharp Laboratories of America*
- P-48: **A New Approach Toward Visual Clarity Assessment Using Perceptual Contrast Length** (Page 1277)  
Miok Shin, Jong-Ho Chong, Sun A Yang, Eunjung Lee, Seung Bae Lee, Brian H. Berkeley *Samsung Mobile Display Co., Ltd.*

## Display Electronics

- P-49: **Design of Digital Time-Modulation Pixel Memory Circuit on Glass Substrate for Low-Power Application** (Page 1281)  
Szu-Han Chen *National Chiao-Tung University*  
Ming-Dou Ker *National Chiao-Tung University & I-Shou University*  
Tzu-Ming Wang *National Chiao-Tung University*
- P-50: **Power Consumption Ameliorated for Integrated Gate Driver Circuit with Low-Frequency Clock** (Page 1285)  
Chih-Lung Lin, Chun-Da Tu, Chia-Che Hung, Mao-Hsun Cheng, Chia-En Wu *National Cheng Kung University*  
Yung-Chih Chen *AU Optronics Corporation*
- P-51: **A Novel Analog Buffer Circuit using Low Temperature Poly-Si TFT** (Page 1288)  
Chih-Lung Lin, Kuan-Wen Chou, Che-Wei Tung, Fu-Chieh Chang, Chia-Che Hung, Chun-Da Tu *National Cheng Kung University*
- P-52: **A New Current-Programming Pixel Circuit for Compensating Luminance Degradation of AMOLED** (Page 1292)  
Chih-Lung Lin, Chia-Che Hung, Sheng-Kai Hsu, Kuan-Wen Chou, Chun-Da Tu *National Cheng Kung University*

- P-53: Dynamic Backlight Control Method for RGBW LCD** (Page 1296)  
Meng-Chao Andy Kao, Pei-Lin Hsieh, Hsiang-Tan Lin *Chunghwa Picture Tubes, Ltd.*
- P-54: A Single-Inductor Bipolar-Output Converter with Power Conservation Mechanism (PCM) for Driving Cholesteric LCD** (Page 1300)  
Kuan-Yu Chu, Yu-Huei Lee, Ming-Yan Fan, Ke-Horng Chen *National Chiao Tung University*  
Sheng-Fa Liu, Pao-Hsien Chiu, Sandy Chen, Chun-Yu Shen, Ming-Ta Hsieh, Huai-An Li *Chunghwa Picture Tubes, Ltd.*
- P-55: A LCD Supplied by High Integrated Dual-Side Dual-Output Switched-Capacitor Regulator with Only Two Flying Capacitors** (Page 1304)  
Chun-Jen Shih, Yu-Huei Lee, Yang-Ching Lin, Ming-Yan Fan, Ke-Horng Chen *National Chiao Tung University*  
Sheng-Fa Liu, Pao-Hsien Chiu, Sandy Chen, Chun-Yu Shen, Ming-Ta Hsieh, Huai-An Li *Chunghwa Picture Tubes, Ltd.*  
Yean-Kuo Luo, Wei-Chou Hsu *National Cheng Kung University*
- P-56: Design of a Gate-Integrated Circuit Using IGZO Thin-Film Transistors for TFT-LCD Panel** (Page 1308)  
Sangjin Jeon, Gwangbum Ko, Jongwoong Chang, Samjin Hwang *Samsung Electronics Co., Ltd.*  
Jaemin Myoung *Yonsei University*
- P-57: Local-Dimming Algorithm to Minimize Maximum Luminance Reproductive Error** (Page 1312)  
Ryosuke Nonaka, Yuma Sano, Masahiro Baba *Toshiba Corporation*
- P-58: Resolution Evaluation of MPC Displays** (Page 1316)  
Shinji Nakagawa, Kazuyoshi Yoshiyama, Hiroyuki Furukawa, Yasuhiro Yoshida, Shigeki Imai *Sharp Corporation*
- P-59: High-Efficiency Direct-Linked Zeta Converter for LED Backlight Units** (Page 1320)  
Eunsuk Oh, Min Sup Song, Bongkoo Kang *Pohang University of Science and Technology*  
Yong Kyu Park *LG Display Inc.*
- P-60: 3-Pair Intra-Panel Interface for 120 Hz 3D Flat Panel Displays** (Page 1324)  
Won Jun Choe, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- P-61: Grayscales by Cross Pairing of Select and Data Voltages in Liquid Crystal Displays** (Page 1326)  
Temkar N. Ruckmongathan *Raman Research Institute*
- P-62: An Integrated Back-end System Design for Active Matrix Electrophoretic Display** (Page 1330)  
Lu Chi-Ming, Chen Yun-Chih, Weng Ming-Chi, Chen Hung-Hsiang, Tseng Wen-Tse, Lee Chuern-Ru *Chunghwa Picture Tubes, Ltd.*
- P-63: New Power Management Technology for Large AMOLED Displays** (Page 1334)  
Jin Woo Kim, Byung Hyuk Shin, Won Jun Choe, Byung Hee Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- P-64: A Simple Data Line Delay Compensation Scheme for AMOLED Panels** (Page 1338)  
Woo-chul Kim, Woo Jun Choe, Byung-Hee Kim, Sang Soo Kim *Samsung Mobile Display Co., Ltd.*
- P-204L: Late-News Poster: A Stable Amorphous Silicon Gate Driver Circuit with Continual Pulse Triggering Method** (Page 1340)  
Tianyi Wu, Jun Ma, Taebo Jung, Kang Yang, Zhongshou Huang, Zhihua Ling *Shanghai Tianma Micro-Electronics Co., Ltd.*
- P-205L: Late-News Poster: A Novel Pixel Circuit for Field Sequential Color LCDs** (Page 1344)  
Xixi Luo, Jun Ma, Zhongli Li, Kang Yang *Shanghai Tianma Micro-Electronics Co., Ltd.*

## Display Manufacturing

- P-65: Flexible Gas-Barrier Technologies with Inorganic Nanolaminate, Surface Modifications and Its Measurements** (Page 1348)  
Jin-Hwan Choi, Eun-Ho Song, Young-Wook Park, Tae-Hyun Park, Jin-Wook Jeong, Hyun-Ju Choi, Ki-Young Dong, Byeong-Kwon Ju *Korea University*  
Jin-Woo Lee, Cheol-Ho Kim, Taeho Kim *Cheil Industries Inc.*
- P-66: Wet Chemical Metallization for High-End Flat Panel Display Manufacturing** (Page 1351)  
Simon Bamberg, Birgit Beck, Horst Brueggmann, Frank Brüning, Elisa Langhammer,

Christian Lowinski, Michael Merschky, Jörg Schulze, Johannes Etz Korn *Atotech Deutschland GmbH*

- P-67: Investigation of Hydrogen-Assisted AI Induced Metal Crystallization Poly-Si** (Page 1355)  
Juan Li *Nankai University*  
Na Zeng *Tianjin University*  
Chong Luo, Chun Jian Yin, Ming Yang, Zhiguo Meng, Shaozhen Xiong *Nankai University*  
Hoi Sing Kwok *The Hong Kong University of Science and Technology*
- P-68: Development of Dye-Containing Hybrid Color PR for LCD Color Filter** (Page 1358)  
Jae-Hyun Kim, Jiyun Kwon, Injae Lee, Juho Jung, Kyunghee Hyung, Taek-Jin Baek, Eui June Jeong, Sangwon Cho, Nam Gwang Kim, Seyoung Choi, Seungwon Yang, Gyuseok Han, Tu-Won Chang *Cheil Industries Inc.*
- P-69: Solution-based Low-cost Process Using Contact Printing for the Fabrication of Organic Light-Emitting Diodes** (Page 1361)  
Tae Hyun Park, Young Wook Park, Jin Hwan Choi, Hyun Ju Choi, Jin-Wook Jeong, Eun Ho Song, Byeong Kwon Ju *Korea University*  
Kyung Cheol Choi *KAIST*
- P-70: Novel Lenticular Lens Fabrication Method on Glass by Using Ink-Jet Printing** (Page 1364)  
Hiroshi Okumura, Jin Matsushima, Hiroshi Tanabe, Hideki Asada *NEC LCD Technologies, Ltd.*
- P-71: Sputtered Transparent Conductive ITO/Ag/ITO Films by Roll to Roll Processing** (Page 1368)  
Bao-Shun Yau, Chih-Chiang Lu, Wei-Jung Lee, Chung-Huang Huang *Industrial Technology Research Institute*
- P-72: Cost Effective Multi-Domain Vertical-Alignment Liquid Crystal Display Using Ink-Jet Printed Protrusions** (Page 1371)  
Sun Woo Park, Hong Jun Yun, Sang Hoon Oh, Se Hyun Lim, Hye Young Gim, Dae Hyun Kim, Myung-Hoon Lee, Seung Hee Lee *Chonbuk National University*
- P-73: Development of Ga-doped ZnO Transparent Electrodes as Alternatives for ITO Electrodes in Liquid Crystal Displays** (Page 1375)  
Naoki Yamamoto, Hisao Makino, Yasushi Sato, Tetsuya Yamamoto *Kochi University of Technology*
- P-74: Synthesis and Characterization of High-Photosensitive Monomers for Black Matrix in Liquid Crystal Displays** (Page 1379)  
Jungsik Choi, Changmin Lee, Kilsung Lee, Jinwoo Park, Kyungwon Ahn, Jiwon Woo, Gyuseok Han, Tuwon Chang *Cheil Industries Inc.*
- P-75: Development of High Viscous Color Photo Resists for Color Filter Repair** (Page 1382)  
Myung-Hwan Chang, Jee-Hyun Ryu, Gyu-Seok Han, Tu-Won Chang *Cheil Industries Inc.*
- P-76: Combined Nanostructured Layers for Display Applications** (Page 1385)  
Aliaksandr Smirnov, Andrei Stsiapanau, Abubakar M. Saddiq, Yauhen Mukha *Belarusian State University of Informatics and Radioelectronics*  
Hoi S. Kwok, Anatoli Murauski *Hong Kong University of Science and Technology*
- P-77: CONWIP for Order Release and WIP Control in Color Filter Fabs** (Page 1388)  
James C. Chen *National Taiwan University of Science and Technology*  
PoTsang B. Huang, Hui-Yu Peng, Ming-Chien Hung *Chung-Yuan Christian University*  
Chih-Cheng Chen, Tzu-Wei Peng, Yu-Yao Wei, Chao-Hsuan Feng *Chunghwa Picture Tubes, Ltd.*
- P-78: Measurement Methods for Solution-Coated AMOLED Display Uniformity** (Page 1392)  
Jonathan Ziebarth, Alejandro Andreatta, Reid Chesterfield, Kyle Frischknecht, Andrew Johnson, Matthew Stainer *DuPont Displays*
- P-79: The Effect of an Air-Gap on Improving the Uniformity of Optical Composite Sheet** (Page 1395)  
Jang Hwan Hwang, Dong Myoung Shin *Hongik University*  
Sung Jin Park, Keun Soo Kim *Finetek Corporation*  
Seok Jae Lee, Ho Won Lee, Young Kwan Kim *Hongik University*
- P-80: Distinguished Student Poster Paper: Instant Design Criteria for LCD Cell with Photospacers under Gravity and Local Loading using Winkler Model** (Page 1398)  
Ling-Yi Ding, Pei-Zen Chang, Wen-Pin Shih *National Taiwan University*

Mao-Hsing Lin *Chimei Innolux Corporation*  
Yuh-Chung Hu *National Ilan University*

- P-81: Thin Beam Laser Crystallization Technology in AMOLED and AMLCD Applications** (Page 1402)  
Yu Cheng Chen, Ulrich Hausmann, Kah Lun Toh, David Knowles *TCZ Pte Ltd.*
- P-82: Synthesis of Zinc Oxide Nanoparticles in Microwave Reactor for TFT Fabrication** (Page 1406)  
Kuan-Ting Kuo, Jen-Chieh Lin *Corning Research Center Taiwan*
- P-206L: Late-News Poster: Colour Filter ITO Deposited with Rotary Sintered Ceramic ITO Targets** (Page 1408)  
Paul Lippens, Mark Haldemann *Umicore Thin Film Products*
- P-220: Invited Poster: Green Technologies for LC Alignment by Organosilicon Compounds Films** (Page 1412)  
Victor V. Belyaev *Moscow Region State University*  
Vera G. Mazaeva *State Scientific Center of Organo-Element Compounds Chemistry and Technology*

## Display Systems

- P-83: Ripple Mechanism and Solution on TFT-LCD** (Page 1416)  
Yong Song, JianMin Duan, HaiJun Qiu, Tae-Yup Min, Bong-Yeol Ryu, Seong Kyu Lee *BOE OT Technology Co., Ltd.*
- P-84: Mechanical Reliability of Digital Micro Shutter (DMS™) Displays** (Page 1419)  
Joyce H. Wu, J. Lodewyk Steyn, Timothy Brosnihan, Gene Fike, John Fijol, Richard Payne, Nesbitt Hagood IV *Pixtronix, Inc.*
- P-85: High-Efficiency Backlight Effectively Using P-Polarized Light** (Page 1423)  
Masaya Adachi, Shiraiishi Yasuhisa, Shigeki Nishizawa, Yoichi Ogawa, Nobuyasu Ishihara *Hitachi Maxell, Ltd.*
- P-86: Collimation Sheet Design for a One-Sided Edge-Lit Backlight** (Page 1427)  
Young Jin Jung, Myongjo Choi, YoungSik O, JeongMin Moon, JaeWon Lee, YongKee Hwang *LG Display*
- P-87: Local-Dimming Design and Optimization for Edge-Type LED Backlight Unit** (Page 1430)  
SoonShun Jung, Miok Kim, DaeYong Kim, JaeWon Lee *LG Display*
- P-88: Active Local Dimming System for Low Power and Motion Blur Enhancement** (Page 1433)  
Donghak Pyo *Samsung Mobile Display*  
Taekwon Jung, Daegwang Jang, Namdeog Kim, Minha Keum, Hakmo Choi, Hoisik Moon *Samsung Electronics Co., Ltd.*
- P-89: Perceptual Motion Blur Measurement Using Minimum Blur Edge Time** (Page 1436)  
Taehee Kim, Jiman Kim, Sungwon Seo, Jiwon Park, Kwoneuy Song, Heeman Kim *Samsung Electronics Co., Ltd.*  
Guiwon Seo, Chulhee Lee *Yonsei University*
- P-90: A Tunable Whitepoint Hardware Solution for Monochrome Medical Displays** (Page 1440)  
Arnout Vetsuypens, Peter Nollet, Cédric Marchessoux *BARCO, Medical Imaging Division*
- P-91: Parametric Evaluation of Computer Displays for Optimized Display Data Transmission** (Page 1444)  
Kyungtae Han, Nithyananda S. Jeganathan, Paul S. Diefenbaugh *Intel Corporation*
- P-92: Rapid and Non-Destructive Lifetime Estimation Method for LED Backlight Displays** (Page 1448)  
Su-Yi Lin, Chi Sheng Chang, Tony Yang, Chang Shin Wu, Chen Cheng Chuan *AU Optronics Corporation*
- P-93: Free Ghost Image and High Transmittance Optical Thin Film Beam Splitter for Head-Up Display** (Page 1451)  
Cheng-Chung Lee, Shu-Hui Tsai *National Central University*  
Chien-Cheng Kuo, Cheng-Huan Chen *National Tsing Hua University*  
Lin-Ming Teng *Union E-O Technology Co., Ltd.*  
Kuang-Tso Luo *Conserve & Associates, Inc.,*
- P-207L: Late-News Poster: White Light Polarized LED Module for LCD Backlighting** (Page 1454)

Chi-Jui Chung, Po-Chun Lin, Cheng-Huan Chen *National Tsing Hua University*  
Han-Ping Yang *Industrial Technology Research Institute*

- P-208L: *Late-News Poster: LSF Correlator: An Amending Module for SSC Local Dimming Algorithm to Increase the Static Contrast of Edge-Lit LCDs*** (Page 1458)  
Marc Albrecht, Daniel Schäfer, Chihao Xu *Saarland University*  
Jan Bauer, Markus Kreuzer *Daimler AG*

## Emissive Displays

- P-94: *Experimental Study on Reduction of Temporal Image Sticking Using Positive Biased- and Floated-Address Waveforms During Sustain Period in AC-PDP with MgCaO Protective Layer*** (Page 1462)  
Choon-Sang Park, Sang-Yup Kim, Sung-Il Chien, Heung-Sik Tae *Kyungpook National University*
- P-95: *A Study of Jitter Characteristics Depending on Wall Charge Status on an Emissive Layer via IR Measurement*** (Page 1465)  
Sangjoon Lee, Sangheum Um, Jungwon Kang *Dankook University*
- P-96: *Analysis of Address Discharge Delay Characteristics Using Transient Characteristics of IR Emission Intensity in Plasma Display Panel*** (Page 1468)  
Hyung Dal Park, Jae Hyun Kim, Heung-Sik Tae *Kyungpook National University*  
Deok Myeong Kim, Jeong Hyun Seo *University of Incheon*
- P-97: *Analysis of the Effects of Changing the Gallium Ratio of SrGa(x)S(4): Eu on Its Optical Properties and Crystal Structure*** (Page 1471)  
Tsuneo Kusunoki, Takamasa Izawa *Sony Chemical & Information Device Corporation*  
Katsuhiko Akimoto, Shin Odakiri *University of Tsukuba*
- P-98: *Distinguished Poster Paper: Effect of Substituting Si with Al and Adding Organic Compounds on the Luminescence Properties of Sialon Phosphor*** (Page 1474)  
Takamasa Izawa, Tsuneo Kusunoki *Sony Chemical & Information Device Corporation*
- P-99: *VUV Photoluminescence of  $(Y_{0.5}Gd_{0.5})PO_4:Eu^{3+}$  Phosphors for Plasma Display Panel Applications*** (Page 1477)  
Ki Young Kim, Mee Hyun Heo, Kyeongsoon Park *Sejong University*
- P-100: *Enhanced Luminescent Properties of Polyacrylic Acid Passivated Mn-doped ZnS Nanocrystal and Its Application to Highly Transparent Luminescent Film*** (Page 1480)  
Ji Yeon Han, Donghyuk Kim, Anush Mnoyan, Duk Young Jeon *Korea Advanced Institute of Science and Technology*
- P-101: *Synthesis of Transparent and Green-Emitting  $CaSO_4:Tb^{3+},Na^+$  Thin Film Phosphors by RF Magnetron Sputtering*** (Page 1484)  
Donghyuk Kim, Ji Yeon Han, Duk Young Jeon *KAIST*
- P-102: *Enhanced VUV Photoluminescence Properties of  $(Y_{0.5}Gd_{0.5})_{0.94-x}Al_x(V_{0.25}P_{0.75})O_4:Eu_{0.06}$  Phosphors by Doping with  $Al^{3+}$***  (Page 1488)  
Ki Young Kim, Mee Hyun Heo, Kyeongsoon Park *Sejong University*
- P-103: *Fabrication and Driving Properties of Novel Side-Anode Field Emission Lamp*** (Page 1491)  
Huai-An Li, Mei-Tsao Chian *Chunghwa Picture Tubes, Ltd.*  
Chi-Fang Huang, Jian-Min Jeng Jeng, Jason Lo Lo *Tatung Company*
- P-104: *Field Emission Properties of Carbon Nanotubes on Flexible Substrate*** (Page 1495)  
Kyongsoo Lee, Yang-Doo Lee *Korea University*  
Gui-Sob Byun *Korea University & University of Seoul*  
Keun-Soo Lee, Byeong-Kwon Ju *Korea University*
- P-105: *Advanced Furnace-Growing Technology to Fabricate Nanowire-Type  $In_2O_3$  Film on Gallium Nitride LEDs*** (Page 1498)  
Jan-Tian Lian *Chunghwa Picture Tubes, Ltd. & National Taiwan Ocean University*  
Kai-Chieh Tsao, Yu-Ming Chang *National Taiwan Ocean University*  
Chun-Wei Su *Chunghwa Picture Tubes, Ltd.*  
Jhao-Ming Zeng, Yi-Chun Lai, Tai-Yuan Lin *National Taiwan Ocean University*
- P-106: *Thermo-mechanical Analysis of HB-LED at Low Temperature*** (Page 1501)  
Peng Fei Ji, Young-Tae Bang, Cheol-Hee Moon, Byung-Ho Kim *Hoseo University*
- P-107: *Colloidal Quantum-Dot LED Transparent Display on a Flexible Substrate*** (Page 1505)  
Yohan Kim, Se Min Kim *Korea Electronics Technology Institute, Dankook University*



Jungwon Kang *Dankook University*  
Chul Jong Han *Korea Electronics Technology Institute*

**P-108: High Performances of the Powder Electroluminescence Device Using the Carbon Nanotubes** (Page 1509)

SeGi Yu *Hankuk University of Foreign Studies*  
Jin-Young Kim *Sungkyunkwan University*  
Shang Hyeun Park, Taewon Jeong, Intaek Han *Samsung Electronics*

**P-209L: Late-News Poster: An All-CMOS Microdisplay Utilizing Integrated Novel Avalanche Light-Emitting Sources** (Page 1512)

Petrus J. Venter, Monuko Du Plessis *University of Pretoria*  
Alfons W. Bogalecki, Pieter Rademeyer *INSiAVA (Pty) Ltd.*

## Flexible Displays

**P-109: Sol-Gel Alumina Dielectric for Low-Voltage Operating Pentacene Transistor** (Page 1516)

Keon-kook Han, Jonghwan Lee *Samsung Electronics Co., Ltd.*

**P-110: An Auto-Calibration Function for Color Electronic Paper Using Cholesteric Liquid Crystals** (Page 1519)

Masaki Nose, Hirokata Uehara *Fujitsu Laboratories, Ltd.*

**P-111: Analysis of Fully Driving Electronic Paper Fabricated Using Particle-Transfer Method** (Page 1523)

Dong-Jin Lee *The University of Seoul*  
Randall E. Sloper *Chungwoon University*  
Yong-Ha Jeon, Sang-Kwuon Han *SK Telecom*  
Sangkug Lee, Kyung-ho Choi *Korea Institute of Industrial Technology*  
Wansoo Huh *Soonsil University*  
Young-Cho Kim *Chungwoon University*

**P-112: Sunlight Readable Bistable Electrowetting Displays for Indicators and Billboards** (Page 1527)

Karlheinz Blankenbach, Michael Jentsch *Pforzheim University*  
Juergen Rawert, Dieter Jerosch *advanced display technology (adt)*  
Andriy Bitman, Frank Bartels *Bartels Mikrotechnik GmbH*

**P-113: Efficiency and Image Enhancement of Organic Light-Emitting Devices by Using Anti-reflection Nanopillars** (Page 1531)

Yu-Hsuan Ho, Chung-Chun Liu, Hsun Liang *Academia Sinica*  
Kuan-Yu Chen *National Taiwan University*  
Chih-Wei Chu, Pei-Kuen Wei *Academia Sinica*

**P-114: Investigation of TIPS-pentacene on Inkjet-Printed Silver Source/Drain Electrodes** (Page 1535)

Seungjun Chung, Donghyun Kim, Jaewook Jeong *Seoul National University*  
Soon-Ki Kwon *Gyeongsang National University*  
Yongtaek Hong *Seoul National University*

**P-115: Electrical, Optical, and ITO Characteristics of a Flexible OLED Display** (Page 1539)

Cheng-Che Lee, Kuen-Cherng Lin, Li-Ling Chu, Wei-yu Lee, Kun-Yi Lee *China University of Science and Technology*  
Jiun-Haw Lee, Chin-Yu Chang *National Taiwan University*  
Shu-Tang Yeh *Industrial Technology Research Institute*

**P-116: A Multi-Line Driving Scheme for R2R PM Ch-LCD** (Page 1542)

Po-Chun Yeh, Heng-Yin Chen, Chao-Chiun Liang, Cheng Wei-Sun, Ju-Yuen Su  
*Industrial Technology Research Institute*

**P-117: Direct Printed Plastic Color Filter for Color Electrophoretic Displays** (Page 1545)

Chia-Ming Chang, Chih-Hsuan Chiu, Yuh-Zheng Lee *Industrial Technology Research Institute*

**P-118: Colorimetric Characterization of Monochromatic Microcup® Electrophoretic Display** (Page 1548)

Yen-Hsing Lu, Chung-Hao Tien *National Chaio Tung University*

**P-119: A New Charge Pump Pixel Circuit for Reflective Displays** (Page 1552)

Myoung-Hoon Jung, Jungwoo Kim, Byonggwon Song, Deukseok Chung, Yunjeong Yi, Yong Wan Jin, Sang-Yoon Lee *Samsung Advanced Institute of Technology*

**P-120: High-Performance Ink-Jet Printed Organic Thin-Film Transistors on Flexible**

- Substrate Using a Small Molecule-Polymer Blend** (Page 1555)  
Sung Hoon Kim, Min Hee Choi, Byung Soon Kim, Jin Jang *Kyung Hee University*
- P-121: Electrokinetics of Charged Particles in Microcup Electrophoretic Displays** (Page 1559)  
Szu-I Wu, Fang-Cheng Lin, Yi-Pai Huang, Han-Ping D. Shieh *National Chaio Tung University*  
Bo-Ru Yang, Ming-Jen Chang, Jo-Cheng Huang, Yao-Jen Hsieh *SiPix Technology, Inc.*
- P-122: Solution-Processed Organic/Inorganic Hybrid CMOS-Type Inverter** (Page 1563)  
Seon-Beom Ji, Seungjun Chung *Seoul National University*  
Soon-Ki Kwon *Gyeongsang National University*  
Yongtaek Hong *Seoul National University*
- P-123: Basic Operation Mechanisms of Floating Metal Ball Actuator Mode as Novel Electronic-Paper Displays** (Page 1567)  
HyoJoo Park, Howon Yoon *Korea University*  
Jongmo Lee, Byungseong Bae *Hoseo University*  
Byunguk Kim *DongJin Semichem Co., Ltd.*  
MunPyo Hong *Korea University*
- P-124: Methods of Measuring Thin Film Thickness on Polymer Substrate** (Page 1570)  
Chih-Jung Chiang, Fu-Shiang Yang *Industrial Technology Research Institute*
- P-125: Modeling of the Performance of Electrowetting Displays** (Page 1573)  
Paul Vermeulen, Johan Feenstra, Andrea Giraldo, Mathieu W. Hampton *Samsung LCD Netherlands R&D Center*  
Jung M. Oh, Frieder Mugele *University of Twente*
- P-210L: Late-News Poster: Percolating Networks Improve Mobility in Organic Semiconductor Devices for Printed Electronics** (Page 1577)  
Ajaykumar R. Jain, George A. Powch *Versatilis LLC*
- P-211L: Late-News Poster: Surface Controlled Coatable Gate Dielectric and Electrical Characteristics** (Page 1581)  
Yukie Isogai, Takeyoshi Katoh, Koichi Sugitani, Masahiro Hanmura, Mitsushi Tada *ZEON Corporation*  
Yoshiki Nakajima, Yoshihide Fujisaki, Toshihiro Yamamoto *Japan Broadcasting Corporation (NHK)*

## Liquid-Crystal Technology:

### 3D

- P-126: Tunable Lenticular Lens Array Using Liquid Crystal on Periodically Undulated Electrodes for Autostereoscopic 2D/3D Convertible Displays** (Page 1584)  
Jun-Hee Na, Seung Chul Park, Se-Um Kim, Sin-Doo Lee *Seoul National University*
- P-127: Fast Liquid-Crystal Light Shutter** (Page 1587)  
Lachezar Komitov, Gurumurthy Hegde *University of Gothenburg*  
Seung Hee Lee *Chonbuk National University*
- P-128: A Novel Polyimide-Free Patterned Retarder 3D Display** (Page 1590)  
Chun-Wei Su, Mei-Sha Shih, Jan-Tien Lien *Chunghwa Picture Tubes, Ltd.*
- P-129: A Novel Design of Ultra-Wide-View Patterned Polarizer for Stereoscopic 3D LCDs** (Page 1592)  
Chao-Te Lee, Hoang-Yan Lin *National Taiwan University*  
Chao-Hsu Tsai *Industrial Technology Research Institute*
- P-212L: Late-News Poster: Adaptive Liquid Crystal Lens for Integral Image 3D Displays** (Page 1596)  
Yifan Liu, Su Xu, Linghui Rao, Shin-Tson Wu *University of Central Florida*  
Hongwen Ren *Chonbuk National University*

### Cholesteric LCs

- P-130: An Advanced Cumulative Drive Scheme for Fast Refreshed Cholesteric LCD** (Page 1599)  
Chih-Jen Chen, Chien-Chih Hsu, Yun-Shuo Chang, Chih-Hung Wu, Cheng-Chung Wu, Chun-Chun Lai, Chao-Chiun Liang *Industrial Technology Research Institute*
- P-131: Fully Integrated Transflective Hybrid Device Consisting of PSCT and In-cell OLED** (Page 1602)  
Cheng-Che Wu, Chi-Feng Lin, Jiun-Haw Lee *National Taiwan University*

Wei-Fu Chang, Tien-Lung Chiu *Yuan Ze University*  
Shun-Wei Liu *Institute of Chemistry, Academia Sinica*

**P-132: Influence of Polymerization Conditions on Response Time of Encapsulated Cholesteric LCs** (Page 1606)

Yuan-Chang Liao, Jhih-Ping Lu, Kuan-Wei Wu *Industrial Technology Research Institute*  
Wei-Yuan Wang *National Sun Yat-Sen University*  
Tsung-Hsien Lin *Industrial Technology Research Institute*

**P-133: Enhancement of Memory Characteristics in Bistable Chiral Splay Nematic Display Mode** (Page 1609)

Kwang-Soo Bae, Uiyeong Cha, Jae-Hoon Kim *Hanyang University*  
Sang Ju Park *Hongik University*  
Chang-Jae Yu *Hanyang University*

### Guest-Host

**P-134: Dye Crystallization in a Guest-Host Display** (Page 1612)

George Siu Ki Lee *Varitronix Ltd.*  
Yeuk Keung Fung *Varitronix Ltd.*

**P-135: A High Reflectivity Fluorescent Guest-Host Polymer Network LC Color Display** (Page 1615)

Yasushi Asaoka, Kiyoshi Minoura, Daisuke Tsukio, Kazuhiro Deguchi, Eiji Satoh, Sayuri Fujiwara, Akio Miyata, Yasuhisa Itoh *Sharp Corporation*

### LC Modelling

**P-136: Optimization of Liquid-Crystal Phased Arrays** (Page 1619)

Sergiy Valyukh *Linköping University*  
Vladimir Chigrinov *Hong Kong University of Science and Technology*

**P-137: An Accurate Electrical Model of a Liquid Crystal Cell in Active-Matrix LCD** (Page 1623)

Chansoo Park, Jong-Man Kim, Jongbin Kim, Youngmin Cho, Seung-Woo Lee *Kyung Hee University*  
Joon-Chul Goh, Chong Chul Chai *Samsung Electronics Co., Ltd.*

### LC Alignment

**P-138: Plasma Beam Alignment of Lyotropic Chromonic Liquid Crystals** (Page 1627)

Oleg Yaroshchuk, Ruslan Kravchuk, Sergii Gubarev, Ivan Protsenko *Institute of Physics, NASU*  
Andrii Golovin, Oleg D. Lavrentovich *Kent State University*

**P-139: Control of Liquid Crystal Pre-tilt Angle Using Reactive Mesogen** (Page 1630)

Yeon-Kyu Moon, Tae-Min Kim, Min-Geon Choi, Jin-Hee Jeong, You-Jin Lee, Chang-Jae Yu *Hanyang University*  
Young Min Kim *Hongik University*  
Jae-Hoon Kim *Hanyang University*

**P-140: The Ion Adsorption on SiO(x) Alignment Film Used for the Low Power LCDs Using Variable Frame Frequency** (Page 1633)

Yi Huang *Liquid Crystal Institute Kent State University*  
Achintya Bhowmik *Intel Corporation*  
Philip J. Bos *Liquid Crystal Institute Kent State University*

**P-141: Vertical Aligned Nematic Mode with Surface Morphology for High Transmittance LCD Application** (Page 1637)

Min Soo Park, Jonghoon Yi, Jin Hyuk Kwon, Jin Seog Gwag *Yeungnam University*

**P-142: Improvement of PDLC Performance by Changing Surface Anchoring Strength** (Page 1641)

Yue Cui, Rafael S. Zola, Young-Cheol Yang, Deng-Ke Yang *Kent State University*

**P-143: Polymer Stabilized In-Plane Field Driven Vertical Alignment Liquid Crystal Device** (Page 1645)

Se Hyun Lim, Dae Hyun Kim, Suck Jae Shin, Woo Chang Woo *Chonbuk National University*  
Heui Seok Jin *Chonbuk National University & Poseung Technical Center*  
Seung Hee Lee *Chonbuk National University*  
Eun Young Kim, Seung-Eun Lee *Poseung Technical Center*

**P-144: Electrooptic Response of FLC: Effect of Alignment Materials** (Page 1648)

Qi Guo, Fan Fan, Tao Du, Vladimir Chigrinov *Hong Kong Institute of Science and*

### Technology

- P-213L: **Late-News Poster: Optimization of High-Aperture-Ratio Fringe-Field Switching Pressure-Resistance Characteristic for Touch-Screen Display** (Page 1650)  
Junhwan Lim, Zunrui Zhang, Falu Yang, Xiongcan Zuo, Ruizhi Yang, Youngyik Ko, Heechul Jung *Chengdu BOE Optoelectronics Technology Co., Ltd.*

### LC Blue Phase

- P-145: **Colloidal Particles Doping Effect on a Blue-Phase Liquid-Crystal Medium** (Page 1654)  
Meng-Fei Wang, Jeoung-Yeon Hwang, Liang-Chy Chien *Kent State University*
- P-146: **Chiral Pitch Dependence of Electro-optic Kerr Effect in Polymer Stabilized Blue Phase** (Page 1658)  
Hyunseok Choi, Hiroki Higuchi, Hirotsugu Kikuchi *Kyushu University*
- P-147: **A Fast Response Time and Wide-Viewing-Angle Transflective Display Using Polymer-Stabilized Blue-Phase Liquid Crystal** (Page 1661)  
Chengqun Song, Qiong-Hua Wang, Jian-Peng Cui, Feng Zhou, Da-Hai Li *Sichuan University*
- P-148: **Fast Color-Switching Device in a Liquid-Crystal Blue-Phase Cell** (Page 1664)  
Ji-Yi Chiou, Hul-Yu Chen *Feng Chia University*  
Sandy Chen *Chunghwa Picture Tubes, Ltd.*
- P-149: **A Reflective Polarizer-Free Display Using Dye-Doped Polymer-Stabilized Blue Phase Liquid Crystals** (Page 1667)  
Hung Shan Chen, Tsung-Han Chiang, Chun-Hung Wu, Hung-Yuan Chen, Yi-Hsin Lin *National Chiao Tung University*  
Hsu-Kuan Hsu *Chimei-Innolux Corporation*
- P-214L: **Late-News Poster: Color Dispersion of a Blue Phase Liquid Crystal** (Page 1671)  
Meizi Jiao, Jin Yan, Shin-Tson Wu *University of Central Florida & Apple Inc.*

### LC Lenses

- P-150: **Tunable Liquid Crystal Lens by Spatially Controlling of Pretilt Angle** (Page 1674)  
Fan Fan, Man-Chun Tseng, Anatoli A. Murauski, Hoi-Sing Kwok, Vladimir G. Chigrinov *Hong Kong University of Science and Technology*
- P-151: **UV-Modified Polyimide Alignment Layers for Liquid Crystal Fresnel Lens** (Page 1676)  
Shug-June Hwang, Tai-An Chen, Kuo-Ren Lin *National United University*  
Shie-Chang Jeng *National Chiao Tung University*
- P-152: **Spatial-Multiplexed/Integral-Imaging 3D Display Using Liquid Crystal Lens** (Page 1678)  
Sheng-Chi Liu, Che-Wei Chang *Chunghwa Picture Tubes, Ltd.*

### LC Materials

- P-153: **High Birefringence Fluoro-Terphenyls for Thin-Cell-Gap LCDs** (Page 1681)  
Yuan Chen, Haiqing Xianyu, Jie Sun, Shin-Tson Wu *University of Central Florida*  
Xiao Liang, Hong Tang *Tsinghua University*
- P-154: **Natural Chiral Dopant D-Limonene for Active Matrix Bistable Cholesteric Displays** (Page 1684)  
Rafael S. Zola, Young-Cheol Yang, Deng-Ke Yang *Kent State University*  
Heng-Yin Chen, Chien-Chih Hsu, Chih-Jen Chen, Chao-Chiun Liang, Kung-Lung Cheng *Industrial Technology Research Institute*
- P-155: **Analysis of Solubilization of Surface-Modified Carbon Nanotube in Nematic Liquid Crystal Using Flory-Huggins Theory** (Page 1688)  
Kevin Y. C. Huang, Andy Y. G. Fuh *National Cheng Kung University*

### TN Mode

- P-156: **Electrically Stabilized Four-Domain Twisted Nematic Structure with High Transmittance and Fast Response** (Page 1691)  
Jin-Hee Jeong, Tae-Min Kim, Min-Geon Choi, Yeon-Kyu Moon, You-Jin Lee, Jae-Hoon Kim, Chang-Jae Yu *Hanyang University*
- P-157: **Twisted-Nematic LCD Switchable between Dynamic and Memory Modes** (Page 1694)  
Dong Han Song, Ki-Han Kim, Jung-Wook Kim, Jae Chang Kim, Tae-Hoon Yoon *Pusan National University*
- P-158: **Fast Switching of Narrow-gap TN-LCDs Embedded with New Nanoparticles and Their Application to FSC-LCDs** (Page 1697)

Brindaban Kundu, Yukihide Shiraiishi, Hiroya Sawai *Tokyo University of Science, Yamaguchi*

Kiyofumi Takeuchi, Haruyoshi Takatsu *DIC Corporation*

Naoki Toshima *Tokyo University of Science, Yamaguchi*

Takeshi Mizumoto, Michio Kitamura *SHINTECH*

Shunsuke Kobayashi *Tokyo University of Science, Yamaguchi*

- P-159: Slit Pattern for Dynamic Stability of TN-VA LCD** (Page 1700)  
Xiaohui Hui Chen, Hongqing Cui, Te-Chen Chung, Tean-Sen Jen *Infovision Optoelectronics Co., Ltd. and Jiangsu FPD Technology & Research Institute*
- P-160: Improvement of the Contrast Ratio in Twisted Nematic LCD** (Page 1704)  
Do-Young Lee, Hee-Kyung Kim, Sang-Hoon Heo, Man-Kyun Lee *Samsung Electronics Co., Ltd.*  
Jang-Kun Song *SungKyunKwan University*
- P-161: A Mono/Dual-View Switchable LCD** (Page 1707)  
Chao Ping Chen *Shanghai Jiao Tong University & Infovision Optoelectronics Co., Ltd. & Jiangsu FPD Technology & Research Institute*  
Xiaojun Guo, Yikai Su *Shanghai Jiao Tong University*  
Te-Chen Chung, Tean-Sen Jen *Infovision Optoelectronics Co., Ltd. & Jiangsu FPD Technology & Research Institute*

### Transflective LCDs

- P-162: Distinguished Student Poster: Sunlight Readable Transmissive LCDs** (Page 1711)  
Hui-Chuan Cheng, Shin-Tson Wu *University of Central Florida*
- P-163: Three-terminal Dye-Doped LC Device Switchable Between Reflective and Transmissive Modes** (Page 1714)  
Ki-Han Kim, Hye-Jung Jin, Byung Wok Park, Dong Han Song, Jae Chang Kim, Tae-Hoon Yoon *Pusan National University*
- P-164: A New Transflective OCB-LCD with In-Cell Compensation Film** (Page 1717)  
Ichiro Fukuda, Yasutada Sakamoto *Kanazawa Institute of Technology*  
Takahiro Ishinabe *Tohoku University*  
Tatsuo Uchida *Tohoku University, Sendai National College of Technology*

### OLEDs

- P-165: A New Class of Blue Phosphorescent Iridium Complexes for Organic Electroluminescent Devices** (Page 1721)  
Michelle Groarke, Sven Andresen, Juo-Hao Li, Karl Weber, Tadahiko Hirai, James Macdonald, Mark Bown, Kazunori Ueno *CSIRO Material Science and Engineering*
- P-166: Successive Cross Emission Driving for 3-Dimensional Active-Matrix Organic Light Emitting Diode Displays** (Page 1725)  
Hong-Sik Park, Hai-Jung In, Kyong-Hwan Oh, Oh-Kyong Kwon *Hanyang University*
- P-167: Characteristics of Polymer Light-Emitting Diode with Solution Processed Graphene Oxide Layer** (Page 1729)  
Jun Ho Youn, Yeon Il Lee, Hie Tae Moon *Korean Advanced Institute of Science and Technology*  
Su Jin Baek, Jin Jang *Kyung Hee University*
- P-168: Room Temperature Deposition of Transparent Conducting Anode for Organic Light-Emitting Diodes** (Page 1733)  
Yoon Duk Ko, Joo Yeob Kim, Hong Chan Joung *Samsung Mobile Display*  
Dong-Jin Son, Dong Geun Jung *SungKyunKwan University*  
Young Sung Kim *Seoul National University of Science and Technology*
- P-169: Single Side Emitting Transparent OLED Lamp** (Page 1737)  
Herbert Lifka, Coen A. Verschure, Dominique M. Bruls *Philips Research*  
Cristina Tanase *Philips Lighting*
- P-170: Influence of HFE Solvent Processing on OLED Lifetime** (Page 1740)  
Alex A. Zakhidov, Björn Lüssen, Karl Leo *Technische Universität Dresden*  
John DeFranco *Orthogonal, Inc.*
- P-171: A Novel Sensor for Simultaneously Monitoring the Composition and Thickness of Co-Deposited Films During Co-Deposition** (Page 1742)  
Kouji Suemori, Satoshi Hoshino, Noriyuki Takada, Toshihide Kamata, Nobuki Ibaraki *National Institute of Advanced Industrial Science and Technology*
- P-172: Optical Lithography in Vacuum for Microstructuring of Small Molecules** (Page 1746)

Harald Gross, Markus Burghart, Udo Willkommen, Erwin Zschieschang *VON ARDENNE Anlagentechnik GmbH*

- P-173: New Triazine Derived Hosts for Next Generation Phosphorescent OLEDs with Enhanced Lifetime and Stability** (Page 1750)  
Banumathy Balaganesan, Shih-Wen Wen, Yi-Huan Fu, Huang-Ming Guo, Kun-Feng Chiang *E-ray Optoelectronics Technology Co., Ltd.*
- P-174: The Electrical Properties of Transparent Emotional OLED Lighting Based on Organic Environmental Sensor** (Page 1753)  
Jin Wook Jeong, Young Wook Park, Jin Hwan Choi, Tae Hyun Park, Hyun Ju Choi, Eun Ho Song, Byeong Kwon Ju *Korea University*  
Jeong Ik Lee, Hye Young Chu *Electronics and Telecommunications Research Institute*
- P-175: Profile of Heterostructured Host for Phosphorescent OLED and Its Application to White Lighting Devices with Low Driving Voltage** (Page 1757)  
Woo Jin Hyun, O Ok Park *Korean Advanced Institute of Science and Technology*  
Byung Doo Chin *Dankook University*
- P-176: Effect of Cathode Reflectivity on Light Enhancement of White OLEDs with Microlens Structure** (Page 1760)  
Chia-Liang Cheng, Hsi-an Chen, Chin H. Chen, Chun-Shiung Chuang *National Chiao Tung University*
- P-177: Extraction of Printed OLED Internal Emission Characteristics** (Page 1764)  
Mark L. Hildner, Jonathan M. Ziebarth *DuPont Displays Inc.*
- P-178: Semi-Transparent Tandem Device Comprising Organic Light-emitting Diodes and Organic Solar Cell** (Page 1767)  
Shun-Wei Liu *National Taiwan University & Academia Sinica*  
Chih-Chien Lee, Jia-Chin Huang *National Taiwan University of Science and Technology*  
Chi-Feng Lin *National Taiwan University*  
Chin-Ti Chen *Academia Sinica*  
Jiun-Haw Lee *National Taiwan University*
- P-179: Efficiency Enhancement of PLED by Using TiO<sub>x</sub> Electron Transport Layer with Prism Sheet Attachment** (Page 1770)  
Yu-Hsuan Ho, Hsun Liang, Hiao-Han Lai, Chia-Wen Chuang, Chih-Wei Chu, Pei-Kuen Wei *Academia Sinica*
- P-180: Low-Reflectance Organic Light-emitting Diode Embedded with Organic Solar Cells** (Page 1773)  
Shun-Wei Liu *National Taiwan University & Academia Sinica*  
Chih-Chien Lee *National Taiwan University of Science and Technology*  
Jia-Ching Huang *National Taiwan University of Science and Technology*  
Wei-Cheng Su *Academia Sinica*  
Chi-Feng Lin *National Taiwan University*  
Chin-Ti Chen *Academia Sinica*  
Jiun-Haw Lee *National Taiwan University*
- P-181: Device Parameters Determination by Numerical Model Fitting for Organic Light-emitting Diodes Using Impedance Spectroscopy Measurements** (Page 1776)  
Tadahiko Hirai, Karl Weber, Juo-Hao Li, Mark Bown, Kazunori Ueno *CSIRO Material Science and Engineering*
- P-182: Lifetime Enhancement by Fabrication of a Doped Graded-emission Layer in Organic Light-emitting Diodes** (Page 1780)  
Chun-Shiung Chuang, Chia-Liang Cheng, Hsi-an Chen, Chin H. Chen *National Chiao Tung University*
- P-215L: WITHDRAWN**
- P-216L: Late-News Poster: Optical Properties of WO<sub>3</sub>/Ag/WO<sub>3</sub> Multilayer as Transparent Electrode in Top Emitting OLEDs** (Page 1784)  
Kihyon Hong, Kisoo Kim, Sungjun Kim, Illhwan Lee, Bon Hyeong Koo, Jong-Lam Lee *Pohang University of Science and Technology*
- P-221L: Late-News Poster: New Blue Phosphorescent Host for High-Efficiency White OLED** (Page 1787)  
Jin-Sheng Lin, Meng-Ting Lee, Miao-Tsai Chu, Mei-Rung Tseng *Industrial Technology Research Institute (ITRI)*

## Projection

- P-183: Development of a High-Brightness Dual-Lamp Projector** (Page 1790)  
Akihiro Yamada, Kuniko Kojima, Jun Someya, Hiroaki Sugiura, Hiroshi Kida, Kenji Samejima *Mitsubishi Electric Corporation*
- P-184: Application of Deep Micromachining of Silicon Substrates to Realize a Novel Electrochromic Based Projection Display** (Page 1794)  
Babak Amirsolaimani, Soheil Azimi, Shams Mohajerzadeh *University of Tehran*
- P-185: A High Efficiency Compact Color-Sequential LCOS Projection Engine with 100% NTSC** (Page 1798)  
LI Tan *Hong Kong University of Science and Technology*  
Jiaxin Sun *Integrated Microdisplays Limited*  
Hoi Sing Kwok *Hong Kong University of Science and Technology*
- P-186: Compensated MTN Mode Field Sequential Microdisplays for Pico Projector Applications** (Page 1801)  
Yuet Wing Li, Kuan Hsu Fan Chiang, Chia Yeh Tsai, Chieng Liang Wu, Chieng Tang Wang, Wei-Hsiao Chen, Hsien-Chang Tsai *Himax Display Inc.*
- P-187: An Electrically Tunable Focusing LCOS Pico Projector Using a Liquid-Crystal Lens** (Page 1804)  
Hung-Chun Lin, Ming-Syuan Chen, Yi-Hsin Lin *National Chiao Tung University*
- P-188: Field Sequential Type 3D Pico-Projector Phone Based on 1 GHz Mobile Application Processor and nHD DMD Chipset** (Page 1808)  
Byeonghoon Park, Jaeyong Cho, Sungsoo Kim, Hyowon Kim, Jinwook Kwon, Kisuk Sung, Homin Lee, Jungkee Lee, Donghoon Jang *Samsung Electronics Co., Ltd.*
- P-189: Patterned Vehicular-Window Screen for 3D Pico-Projector Applications** (Page 1810)  
Wallen Mphepö *iVorex AB & Beijing Normal University*  
Justin Weijia He *Beijing Normal University*

## Touch Systems

- P-190: High SNR Multi-Touch Capacitance Touch-screen Controller with Haptics Support** (Page 1814)  
Timothy L. Blankenship *Maxim Integrated Products*
- P-191: Embedded Nano-Si Optical Sensor in TFT-LCDs Technology and Integrated as Touch-Input Display** (Page 1818)  
An-thung Cho, Ming-Hung Chung, Tien-Hao Chang, Chi-Wen Fan, Wei-Peng Weng, Yu-Min Lee, Chung-Hong Kuo, Chun-Huai Li, Jiun-Jye Chang, Ming-Feng Chiang, Wei-lung Liao *AU Optronics (AUO) Corporation*
- P-192: Novel Flexible Photosensing Pixel for Large Size Electrophoretic Display with Pen Writing Function** (Page 1822)  
Chen-Pang Kung, Wen-Jen Chiang, Yu-Jen Chen, Pi-Hsien Wang, Ming-Hsi Wang, Jia-Chong Ho, Chen-Chung Lee *Industrial Technology Research Institute*
- P-193: Optool™ DAC-HP: An Anti-fingerprint Coating Material for Touch Panel Screens** (Page 1826)  
Ken Milam, Ron Hendershot *Daikin America*
- P-194: Tracking Hand Gestures with Depth Detection for a 3D Interactive Display** (Page 1830)  
Tzu-Fan Huang, Yung-Yuan Kao, Paul C.-P. Chao *National Chiao Tung University*
- P-195: Multi-User and Multi-Touch System for 3D-Interactive Display** (Page 1834)  
Hsuan-Yu Tung, Gao-Zhen Wang, Yi-Pai Huang *National Chiao Tung University*  
Hung-Wei Tseng, Jui-Chi Lo, Chung-Hong Kuo *AU Optronics Corporation 4*
- P-196: Adding Interactivity to Displays Using the Q-Foil Technology** (Page 1838)  
Robert Koeppel *isiQiri Interface Technologies GmbH*  
Anton Neulinger, Petr Bartu, Martin Egginger, Siegfried Bauer *JKU Linz*
- P-197: Active Matrix Touch Sensor Detecting Time-Constant Change Implemented by IGZO TFTs** (Page 1841)  
Lu-Sheng Chou, Hao-Lin Chiu, Kuan-Ta Lin, Ya-Hsiang Tai *National Chiao Tung University*
- P-198: Kalman Filter Smooth Tracking Based on Multi-Touch for Capacitive Panel** (Page 1845)  
Chih-Lung Lin, Yi-Ming Chang, U-Chen Lin, Chia-Sheng Li *National Cheng Kung University*  
Alvin Lin *Cando Corporation*

- P-199: 3D Finger Touch with Sequential Illuminator** (Page 1848)  
Ming-Ching Ma, Guo-Zhen Wang, Yi-Pai Huang *National Chiao Tung University*
- P-200: The Design of Novel Integrated Optical Touch TFT-LCD Display** (Page 1852)  
Tzu-Ling Niu, Fu-Cheng Fan, Han-Ping Kuo *AU Optronics Corporation*
- P-217L: Late-News Poster: Glass Impact on Capacitive Touch-Sensing Algorithms: Thinner and Shaped Cover Glass** (Page 1856)  
Zachi Baharav *Corning West Technology Center*  
Ramakrishna Kakarala *Nayang Technological University*
- P-218L: Late-News Poster: Anti-Microbial Coatings that Prevent Bacterial Growth on Touchscreens** (Page 1860)  
Pradnya Nagarkar, Mahfuza Ali, Narina Stepanova *3M Corporation*
- P-219L: Late-News Poster: Simultaneous Normal and Shear Force Sensors for Flexible and Transparent Display Applications** (Page 1862)  
Tsun-Yi Chen, Yung-Chen Wang, Rongshun Chen, Cheng-Yao Lo *National Tsing Hua University*



## P-76: Combined Nanostructured Layers for Display Applications

**Aliaksandr Smirnov, Andrei Stsiapanau, Abubakar Saddik, Yauhen Mukha**  
 Belarusian State University of Informatics and Radioelectronics, P. Brovki Str.,6,  
 220013 Minsk, Republic of Belarus

**Hoi S. Kwok and Anatoli Murauski**  
 Hong Kong University of Science and Technology, Kowloon, Hong Kong

### Abstract

*One-step cost effective process of fabrication of a full inorganic nanostructured transparent conductive electrode and LC alignment layer has been developed. More specifically, the subject comprises a self-organized nanomesh of a valve metal, concomitant porous oxide layer with various functionality and electrochemical method of their fabrication. The nanomesh film is electrically conductive, optically transparent and flexible. It can be fabricated on a variety of substrates, including flexible and rigid substrates. High effective LC alignment layers based of nanostructured alumina can be fabricated at the same anodization process by special electro-chemical technique in sulfuric and oxalic acids to form a self ordered nanoporous structure of alumina which has a "vertical" surface area that prevails over the "horizontal" one even though Al film's thickness is small. The possibility to control distances between pores and their sizes during the process of anodizing/etching enables to optimize alignment surface according to the required LC material.*

### 1. Introduction

Transparent conductive layers coating different dielectric and semiconductor surfaces are widely used as electrodes in flat liquid crystal and OLED displays, touch panels, solar cells, and as antistatic or electromagnetic wave shielding films as well.

Currently, physically or chemically deposited metal oxides, such as indium tin oxide (ITO) or  $ZnO_x$ , are the industrial standard materials to provide optical transparency and electrical conductivity. However, metal oxide films are fragile and prone to damage during bending or other physical stresses. They are also requiring of high deposition and/or high annealing temperatures to achieve needed conductivity and better adhesion to a substrate. In addition, the deposition is a costly process demanding complicated equipment.

Conductive polymers have also been used as an optically transparent layer. However, they generally have lower conductivity and higher optical absorption (particularly at visible wavelengths) compared to the metal oxide films, and suffer from lack of chemical and long term stability. Nowadays, transparent metal mesh films also exist, but they are costly and require a high-precision masking. Accordingly, there is a demand to fabricate transparent conductors possessing desirable electrical, optical and mechanical properties, in particular, transparent conductors that are adoptable to any substrates and can be manufactured in a low-cost high-throughput process.

We propose a new technological approach to fabricate a nanostructured transparent conductive electrodes by electrochemical anodization of valve metals (see Figure 1). This technology provides the self organization of a transparent

conductive nanomesh of a valve metal and doesn't require any photolithographic process. Moreover, nanoporous oxide layers over a nanomesh can be used either as it is or with filled pores as an alignment, antireflective or optically active (e.g. dyeing) layer as well (Figure 2).

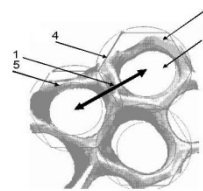


Figure 1. Schematic view of a nanomesh.

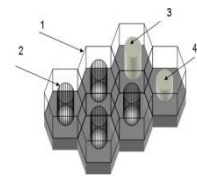


Figure 2. Al nanomesh covered with a porous alumina.

### 2. Incomplete Electrochemical Anodization

The technology of fabrication of nanostructured transparent conductive layers represents a technology of incomplete electrochemical anodization of valve metals which means that the anodization process is to be either terminated or modified at a moment when the bottoms of pores will reach the bottom of an anodized metal film but the whole metal has not been anodized yet, thus the rest of the metal represents a connected area.

The structure of an Al nanomesh and a nanoporous alumina oxide resembles a cellular structure with hemisphere bottoms of pores. At the definite moment when the anodization front reaches a substrate, the whole metal under the bottom of a hemisphere pore has already been anodized with the metal being left non anodized (Figure 2) on the periphery of hemispheres. Such non planarity of the anodization front allows to produce a nanomesh of a valve metal (Figure 1).

### 3. Results and Discussion

The geometry of a nanoporous oxide, dimensions of pores and the distance between them in particular (Figure 2), will depend on the anodization mode, applied voltages and choice of electrolyte. Mesh spacing will depend on a pore dimension and wall thickness (the latter is determined by the value of applied voltage). The anodization can be carried out within the range of 5V - 300V in solution of sulfuric, phosphorous, oxalic, citric or tartaric acids corresponding to needed porosity of anodized valve metal. These regimes allow to reach a mesh spacing within the range of 10 -500 nm. As can be seen from Figure 2 the anodization process protects the metal nanomesh with a layer of porous alumina oxide which is obtained due to the same process [1]. SEM photo of the aluminum nanomesh after selectively etching of  $Al_2O_3$  skeleton is presented in Figure 3.

In a nanomesh film its transparent and conductive functions are separated in space, but this feature doesn't come out due to a sub wavelength size of the nanomesh pitch. It allows overcoming some fundamental limitations, which are specific to ITO and ultrathin metal films, where conductive electrons works as electric charge carriers and light absorbers simultaneously.

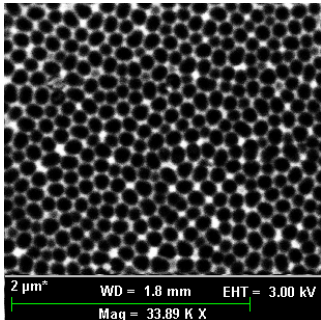


Figure 3. SEM of the aluminum nanomesh.

High effective LC alignment layers based of nanostructured alumina can be fabricated at the same anodization process. To do this a magnetron sputtered 0.5-1 μm Al thin films were anodized by special electrochemical technique in sulfuric and oxalic acids to form a self-ordered nanoporous structure of alumina which has a "vertical" surface area that prevails over the "horizontal" one even though Al film's thickness is small [2]. The possibility to control the changes of distance between pores and their sizes during the process of anodizing/etching enables to optimize alignment surface according to the required LC material.

In addition the described technology has a number of other advantages:

- nanoporous alumina acts as a high quality dielectric and provides additional protection of LC molecules from undesirable chemical reactions near an alignment surface;
- nanoporous alumina is stable and resistant to external actions including heat, UV radiation and mechanical stress, thus prevailing in this respect over commonly used polymers;
- both Al magnetron sputtering and anodizing are low temperature processes compatible with the use of flexible substrates.

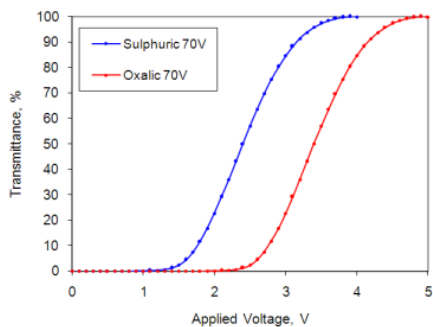


Figure 4. Threshold voltages of LC cells.

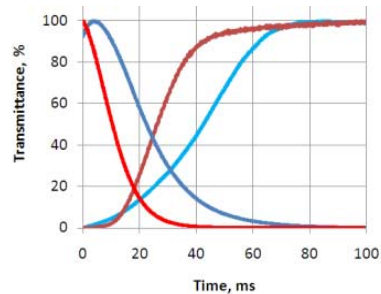


Figure 5. Switching times of LC cells.

Different sizes of pores lead to the change of threshold voltages: lowest voltages are for sulfuric acid (see Figure 4) and switching times: highest times are for sulfuric acid (see Figure 5).

So, we presented quite simple and cost effective technology based on electrochemical method of fabricating of nanostructured alumina which can serve not only as alignment layers but as color RGB-filters or light absorbers as well [3]. Moreover, this technology can be scaled on large-size substrates, including flexible one, i.e compatible with continuous "roll-to-roll" processes.

Test LC cells with Al nanomesh electrodes and nanoporous alumina alignment layers fabricated by one-step anodization process are shown at Figure 6 and Figure 7 [4-6].

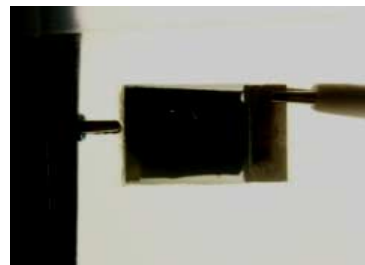


Figure 6. Switch off LC cell with aluminum nanomesh electrodes and nanoporous alumina alignment layers.

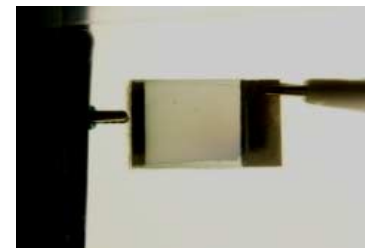


Figure 7. Switch on LC cell with aluminum nanomesh electrodes and nanoporous alumina alignment layers.

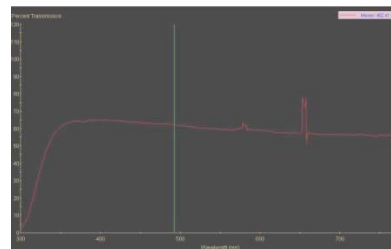


Figure 8. Transparency of nanomesh with alignment layer

The alignment layer produced on Al<sub>2</sub>O<sub>3</sub> with Al nanomesh possesses the same transparency as the alignment layer produced on ITO with sub layers (Figure 8) this also makes the manufacturing process easier by reducing the number of operations.

#### 4. Conclusion

One-step cost effective process of fabrication of a full inorganic nanostructured transparent conductive electrode and LC alignment layer has been developed. The nanomesh film is electrically conductive, optically transparent and flexible. It can be fabricated on a variety of substrates, including flexible and rigid substrates. High effective LC alignment layers based of nanostructured alumina can be fabricated at the same anodization process by special electro-chemical technique in sulfuric and oxalic acids to form a self ordered nanoporous structure of alumina. The possibility to control distances between pores and their sizes during the process of anodizing/etching enables to optimize alignment surface according to the required LC material.

#### 5. References

- [1] A. Stsiapanau et al., Proc. 29<sup>th</sup> Int. Display Res. Conf., 2009. Rome: pp. 548-550.
- [2] A. Stsiapanau et al., Proc. ASID-2009 Conf., 2009, Guangzhou, China: pp.318-320.
- [3] A. Stsiapanau, P. Jaguiro, A. Smirnov, H. Kwok, A. Murauski and Y. Jacob, Nanostructured metal transparent conductive layer and method of its self-ordered fabrication from valve metal film, USA Patent No. application 61/213,283 on 05/26/2009 (2009)
- [4] P. Jaguiro, A. Stsiapanau, A. Hubarevich, Y. Mukha and A. Smirnov, Self-organized nanostructured anodic oxides for display applications, Semiconductor Physics, Quantum Electronics & Optoelectronics, 2010. V. 13, N 3. pp. 305-308
- [5] A. Smirnov, A. Stsiapanau, New type of a transparent conductive nanostructured thin film for photonic devices, Abstracts of Int. Conf. "Global Photonics-2010", Singapore, December 2010 p.64
- [6] A. Smirnov, Nanoporous alumina for an effective LC alignment, Abstracts of Int. Conf. "Global Photonics-2010", Singapore, December 2010, pp. 84-85