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FRAUNHOFER INSTITUTE FOR ORGANIC ELECTRONICS,
ELECTRON BEAM AND PLASMA TECHNOLOGY FEP

SID
SOCIETY FOR INFORMATION DISPLAY

SID-ME CHAPTER
SPRING MEETING 2017

13 – 14 MARCH 2017 | DRESDEN, Germany

Wearable and Projection Displays

Program & Abstracts

Micro and small size display technologies, systems and applications

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FRAUNHOFER INSTITUTE FOR ORGANIC ELECTRONICS,
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CUSTOMER-SPECIFIC R&D

Device and process development, integration, prototyping, pilot-fabrication and transfer

OLED-on-Silicon microdisplays
- "Bi-directional": Single-chip OLED microdisplay and embedded image sensor
- Ultra-low power OLED microdisplays and near-to-eye modules (e.g., for wearable visualization and EVF)
- Large-area microdisplays (e.g., for VR applications) *www.lomid.eu*
- Interactive (eye-controlled) see-through head-mounted display (ST-HMD) smart glasses (e.g., for AR applications)

Organic and silicon-CMOS-based optoelectronic sensors
- Organic photo diode (OPD) imager arrays (on glass, foil or silicon CMOS)
- Imaging & non-imaging optical excitation and sensing (UV, VIS, NIR)
- Application examples: optical fingerprint sensing, surface metrology, biological cell inspection, dynamic labelling, point-of-use diagnostic, hyperspectral imaging, …

3D-Displays (steerable backlight)

Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP
Winterbergstraße 28 | 01277 Dresden, Germany | www.fep.fraunhofer.de

CONTENT

Information & Program

Abstracts

EXHIBITION AND SPONSORING

MEYER BURGER

HOLOEYE **Pioneers in Photonic Technology**

WIRTSCHAFTSFÖRDERUNG SACHSEN

X-FAB MIXED-SIGNAL FOUNDRY EXPERTS

aspect systems

FUJIFILM Value from Innovation

Dimatix

Fraunhofer IOF

Fraunhofer FEP

Meyer Burger (Germany) AG	Hohenstein-Ernstthal
HOLOEYE Photonics AG	Berlin
Wirtschaftsförderung Sachsen GmbH	Dresden
X-FAB Dresden GmbH & Co. KG	Dresden
Aspect Systems GmbH	Dresden
FUJIFILM Dimatix, Inc	Santa Clara, CA, USA
Fraunhofer IOF	Jena
Fraunhofer FEP	Dresden

TOPICS

Technologies

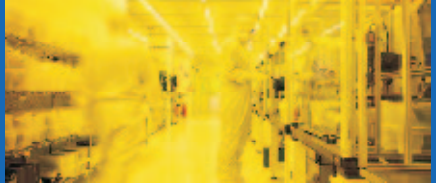
- Micro- and small-size displays
  - e.g., OLED, LCD, LCOS / FLCOS, MEMS, LED, laser, electrophoretic
    Component design, manufacturing technology
- Bendable, flexible, rollable displays
- Backplane and frontplane technology
- Display-embedded sensors and actors (e.g., optical, haptic, sound)
- Non-standard display form-factors (e.g., round-shaped)

System Integration

- System design and manufacturing for
  - Near-to-eye displays (NTE), head-mounted displays (HMD), Smart glasses
  - Electronic viewfinders
  - Smart watches, Smart contact lenses
  - Displays for wearable sensing (e.g., health / fitness tracker)
- Sensor and service integration (e.g., gesture recognition, interaction)
- Optics (e.g., near-to-eye, micro-projection, light-field, illumination)
- Low-power electronics, data interfaces, image processing, power supply
  (e.g., energy harvesting, batteries)
- Software, firmware

Applications / Markets

- Near-to-eye projection, smart glasses, smart contact lenses, augmented /
  virtual reality (AR / VR)
  - Industry 4.0 (e.g., automation, logistics, assembly, quality assurance)
  - Automotive (e.g., HUD / HMD in cars or motorcycles)
  - Medical (e.g., intensive care, sensorineural-impaired)
  - Sports and leisure
  - Safety / security
  - Electronic viewfinder in consumer and professional video
- Personal and professional wearable display applications
  - Smart watches
  - Personal health (e.g., fitness, medication, skin patch), medical
    (e.g., tele medicine, diagnostics)
  - Wearable signage (e.g., alerts, advertising, translation, fashion, art)
- Ergonomics
- Training / Education



GENERAL INFORMATION

Conference Chairs

General Chair:	Dr. Uwe Vogel, Fraunhofer FEP
Executive Chair:	Ines Schedwill, Fraunhofer FEP
Program Chair:	Dr. Beatrice Beyer, Fraunhofer FEP

Program Committee

Achin Bhowmik, Ph.D.	Intel Corporation, Santa Clara, USA
Hong K. Choi, Ph.D.	Kopin Corporation, Westborough, USA
Dr. Gunther Haas	Microoled, Grenoble, France
Bernard Kress, Ph.D.	Microsoft, Mountain View, USA
Prof. Arokia Nathan	University of Cambridge, Cambridge, UK
Dr. Michael Totzeck	Carl Zeiss AG, Oberkochen, Germany
Prof. Ian Underwood	University of Edinburgh, Edinburgh, UK
Klaus Zimmermann	Sony Deutschland GmbH, Stuttgart, Germany

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Congress Venue

Quality Hotel Plaza Dresden
Königsbrücker Straße 121a | 01099 Dresden
www.qualityhotelplazadresden.de

Conference Language

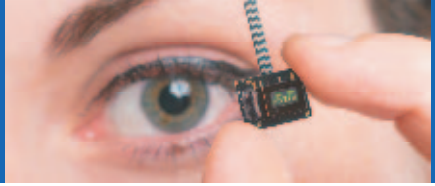
English is the official language of the meeting. No translation facilities are provided.

Social Event and Networking

The evening event takes place on March 13, 2017 in "Felix Im Lebendigen Haus".

Address:
Felix Im Lebendigen Haus
Kleine Brüdergasse 1-5 | 01067 Dresden
felix.daslebendigehaus.de

Tram station "Postplatz":
tram no. 1, 2, 4, 8, 9, 11 and 12
from Quality Hotel Plaza Dresden:
tram no. 8 (direction "Südvorstadt")



PROGRAM

MONDAY, 13 MARCH 2017

09.00 – 11.00	**Scientific Tour 1 (Fraunhofer Campus City Center)** *Fraunhofer FEP equipment for electron beam structuring of micro-displays, roll-to-roll line for organic electronics, plants for precision coatings and coatings on ultra-thin-glass and other flexible substrates* **Scientific Tour 2 (Fraunhofer FEP, Campus North)** *Showroom tour (flexible organic electronics, OLED microdisplays etc.), overview about Fraunhofer FEP activities*
12.00	**Welcome guests** **Accompanying Poster Session**
13.00 – 13.15	**Opening and Session Chair** *Dr. Uwe Vogel, Fraunhofer FEP, Germany*
13.15 – 13.50	**KEYNOTE** **Designing Mixed Reality (MR) wearable displays** *Bernard Kress, Ph.D., Microsoft Corporation, USA*
13.50 – 14.20	**INVITED** **Review of Current Microdisplay Technologies** *Prof. Ian Underwood, University of Edinburgh, UK*
14.20 – 14.50	**INVITED** **Applications of Microdisplays in AR and VR** *Hong K. Choi, Ph. D., Kopin Corporation, USA*
15.00 – 15.45	**Coffee Break / Poster Session**
15.45 – 16.10	**Market trends and forecasts for wearable displays** *Dr. Guillaume Chansin, IDTechEx, UK*
16.10 – 16.35	**Thin and spherical-cap-shaped LCD with a flexible thin-film driver for use in a smart contact lens** *Prof. Herbert De Smet, Ghent University & imec, Belgium*
16.35 – 17.00	**Low Temperature Atomic Layer Deposition as an enabling technology in the manufacturing of OLED displays** *Dr. Lydia Baril, Encapsulix SAS, France*
17.00 – 17.25	**Industrial scale manufacturing of transparent and flexible moisture barriers** *Luca Gautero, Ph. D., Meyer Burger (Netherlands) B.V., Netherlands*

17.25 – 17.50	**Advanced microdisplays and imagers – achieved by synergy of IC design and OLED/OPD technology development** *Bernd Richter, Fraunhofer FEP, Germany*
18.00	**End**
19.00 – 00.00	**Evening Event** *Reception at "Felix Im Lebendigen Haus", Dresden City Centre*

PROGRAM

TUESDAY, 14 MARCH 2017

08.30	**Welcome guests** **Accompanying Poster Session**
09.00 – 09.10	**Opening and Session Chair** *Prof. Herbert De Smet, Director SID Mid-Europe, Ghent, Belgium*
09.10 – 09.45	**KEYNOTE** **5G – enabler for consumer AR/VR** *Prof. Frank H.P. Fitzek, Deutsche Telekom Chair of Communication Networks, Technische Universität Dresden, Germany*
09.45 – 10.15	**INVITED** **Highly energy efficient and compact OLED microdiplays and their use in wearables** *Dr. Gunther Haas, Microoled, France*
10.10 – 10.40	**Large cost-effective OLED microdisplays and their application** *Dr. Beatrice Beyer, Fraunhofer FEP, Germany*
10.40 – 11.10	**Coffee Break / Poster Session**
11.10 – 11.35	**National Funded Project "Glass@Service" – An Approach to Interactive Personalized Visualization in Industry Processes with Smart Glasses** *Christian Wegener, Siemens AG, Germany*
11.35 – 12.00	**Atomized scan strategy for high definition OLED microdisplay** *Wendong Chen, Shanghai University, China*
12.00 – 12.25	**InP-based Quantum Dots for highly efficient solution based QLEDs** *Dr. Armin Wedel, Fraunhofer IAP, Germany*
12.25 – 13.30	**Lunch Break**

13.30 – 14.00	**Award ceremony SID-ME Chapter Best Student Award** *(incl. 15 min student presentation)* **Session Chair** *Dr. Beatrice Beyer, Fraunhofer FEP, Germany*
14.00 – 14.35	**KEYNOTE** **AMOLED Displays - A Review of Device-Circuit Interactions and Compensation Techniques** *Prof. Arokia Nathan, University of Cambridge, UK*
14.35 – 14.55	**INVITED** **Display technologies – Where is the EU?** *Dr. Henri Rajbenbach, European Commisson, Belgium*
14.55 – 15.15	**Electron Beam Micropatterning and Thermal Processing of Organic Light Emitting Devices** *Elisabeth Bodenstein, Fraunhofer FEP, Germany*
15.15 – 15.45	**Coffee Break / Poster Session**
15.45 – 16 15	**INVITED** **GaN LED micro-displays for digital and structured lighting applications** *Prof. Martin Dawson, University of Strathclyde, UK*
16.15 – 16.40	**GaN-based Emissive Microdisplays: a Very Promising Technology for Augmented Reality Systems** *Dr. Francois Templier, CEA-Leti, France*
16.40 – 17.05	**LEDs for Augmented Reality Near-to-Eye Displays** *Dr. Stefan Morgott, Osram Opto Semiconductors GmbH, Germany*
17.15	**End**

POSTERS

ACCOMPANYING POSTER SESSION

Characterization and Modelling of Tandem structure OLED
Hanning Mai, University of Edinburgh, UK

High-resolution OLED Patterning for Microdisplays
Dr. Matthias Schober, Fraunhofer FEP, Germany

Pulse magnetron sputtering for pre-encapsulation and large area precision optical coatings
Dr. Daniel Glöß, Fraunhofer FEP, Germany

FEF: Fast Ellipse Fitting in Real-World
Marcus Penzel, University of Applied Sciences Zwickau, Germany

Organic light-emitting diodes allow for active beam-shaping without additional optical elements
Felix Fries, Technische Universität Dresden, Germany

Integration of light functionality within textiles by flexible OLED lighting
Jan Hesse, Fraunhofer FEP, Germany

Electrical properties of SAM-modified ITO surface using aromatic small molecules with double bond carboxylic acid groups for OLED applications
Prof. Siddik Icli, Ege University, Solar Energy Insitute, Izmir, Turkey

The Personal Reader: A New Way to Read
Avram Shlemeh Adler, Personal Reader Project, Israel

A novel IPS-VA pixel architecture for phase modulation and beam-steering application
Clément Abélard, CEA-Leti, France

The LOMID H2020 project for large microdisplays
James Whitby, Amanuensis GmbH, Switzerland

OLEDs on CMOS Automated Encapsulation Cluster
Jens Drechsel, CreaPhys GmbH, Germany
Wolfgang Ganter, M. Braun Inertgas-Systeme GmbH, Germany

Electron Beam Micropatterning and Thermal Processing of Organic Light Emitting Devices
Elisabeth Bodenstein, Fraunhofer FEP, Germany

Ultraviolet Laser Separation of Flexible Devices
Ralph Delmdahl, Coherent LaserSystems GmbH & Co. KG, Germany

ABSTRACTS | TALKS

TUESDAY, 14 MARCH 2017

KEYNOTE

Designing Mixed Reality (MR) wearable displays

Bernard Kress, Ph.D., Microsoft Corporation, USA

A Mixed Reality (MR) wearable display is built up of basic optical sub-systems, for which multiple implementation options exist in industry:

- The display engine (image generation and imaging optics)
- The combiner optics (superposition of digital image onto reality)
- The eyebox expansion optics (covering a target IPD range)
- The sensor optics (head tracking, depth mapping and gesture sensing)

We review such optical building blocks, their advantages and limitations, their availability in industry as well as their inter-compatibility to form cohesive AR/MR display systems. We also discuss the choices we made at Hololens to build up the best in class AR/MR hardware experience to date, providing the best wearable and visual comfort to the end user.

INVITED

Review of Current Microdisplay Technologies

Prof. Ian Underwood, University of Edinburgh, UK

The seminar introduces the concept of a microdisplay. Some primary performance parameters of microdisplays are listed and explained. We offer a classification of microdisplay types with a qualitative description and comparison of some of the main contemporary microdisplay technologies.

INVITED

Applications of Microdisplays in AR and VR

Hong K. Choi, Ph. D., Kopin Corporation, USA

Microdisplays are widely used in AR applications ranging from pilot helmet-mounted displays, enterprise headsets, to consumer headsets. For compact VR headsets, a new OLED 2k x 2k microdisplay that operates at 120 Hz has been developed, which will provide realistic, comfortable and overall satisfying experience for the user.

Market trends and forecasts for wearable displays

Dr. Guillaume Chansin, IDTechEx, UK

Wearable devices such as fitness trackers, smart watches, AR and VR headsets have display requirements that are often challenging. This presentation will give a review of the latest technologies and our market forecasts.

Thin and spherical-cap-shaped LCD with a flexible thin-film driver for use in a smart contact lens

Prof. Herbert De Smet, Ghent University & imec, Belgium

A spherical-cap-shaped liquid crystal display is reported that can be embedded inside a contact lens. A combination of thermoplastic simulations, appropriate choice of materials and thermoforming parameters allowed the realization of a wrinkle-free device that can be used for several applications. The flexible driving electronic consists of metal-oxide TFTs and is powered by thin-film photovoltaics.

Low Temperature Atomic Layer Deposition as an enabling technology in the manufacturing of OLED displays

Dr. Lydia Baril, Encapsulix SAS, France

Atomic Layer Deposition (ALD) allows the deposition of thin coatings with extreme precision and film quality. Up to now, industrial application of the method was limited due to the slow deposition rate. Encapsulix has introduced the Parallel Precursor Wave ultrafast ALD method allowing to increase deposition rates by up to a factor of 30. In this presentation, we will review recent work on the deposition of various layers as relevant for OLED display related application using the Parallel Precursor Wave ultrafast ALD method. After an introduction of the method and a comparison with existing ALD techniques, we will review process results for different deposition processes as relevant for OLED fabrication:

- Ultrabarrier encapsulation materials such as Al_2O_3, TiO_2, ZrO_2, and multilayers and nanolaminates comprising these materials
- Transparent Conductive Oxides such as Aluminum doped ZnO (AZO)
- Functional organic materials such as Alucone and AlQ_3

Finally, some manufacturing related aspects will be adressed.

Industrial scale manufacturing of transparent and flexible moisture barriers

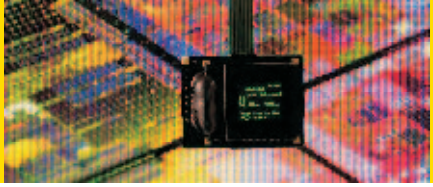
Luca Gautero, Ph. D., Meyer Burger (Netherlands) B.V., Netherlands

Marketability of wearable displays benefits from high throughput manufacturing of thin film moisture barriers. These are stacks of PECVD or spatial-ALD inorganics, and jettable or dispensable organics. Transparent and flexible barriers with low WVTR are manufactured at low temperatures. Compared to laboratory or pilot production we present R2R and S2S throughput above several meter/hour.

Advanced microdisplays and imagers – achieved by synergy of IC design and OLED/OPD technology development

Bernd Richter, Fraunhofer FEP, Germany

The combination of classical microelectronics with organic technologies allows the realization of advanced microdisplays and imagers. This work presents the key technologies and the spectrum of devices and applications from ultra-low power displays for mobile applications, displays with embedded image sensors for fingerprint applications to imagers with extended spectral range based on organic photodetectors.



ABSTRACTS | TALKS

TUESDAY, 14 MARCH 2017

KEYNOTE

5G – enabler for consumer AR/VR

Prof. Frank H.P. Fitzek, Deutsche Telekom Chair of Communication Networks, Technische Universität Dresden, Germany

Frank H. P. Fitzek is a Professor and head of the "Deutsche Telekom Chair of Communication Networks" at TU Dresden coordinating the 5G Lab Germany.

He co-founded several start-up companies starting with acticom GmbH in Berlin in 1999. He has visited various research institutes including Massachusetts Institute of Technology (MIT), VTT, and Arizona State University. In 2005 he won the YRP award for the work on MIMO MDC and received the Young Elite Researcher Award of Denmark. He was selected to receive the NOKIA Champion Award several times in a row from 2007 to 2011. In 2008 he was awarded the Nokia Achievement Award for his work on cooperative networks. In 2011 he received the SAPERE AUDE research grant from the Danish government and in 2012 he received the Vodafone Innovation price. In 2015 he was awarded the honorary degree "Doctor Honoris Causa" from Budapest University of Technology and Economy (BUTE).

His current research interests are in the areas of wireless and mobile 5G communication networks, mobile phone programming, network coding, cross layer as well as energy efficient protocol design and cooperative networking which will be the main topic of his talk.

INVITED

Highly energy efficient and compact OLED microdiplays and their use in wearables

Dr. Gunther Haas, Microoled, France

We will present our latest developments on OLED microdisplays dedicated to Smartglasses and Augmented Reality. Main features are very high brightness for outdoor use, ultra-low power consumption, and very compact footprint. Together with suitable see-trough optics, these components will enable smart eyewear featuring extremely interesting form factor and long battery life, both for consumer and professional applications.

Large cost-effective OLED microdisplays and their application

Dr. Beatrice Beyer, Fraunhofer FEP, Germany

The latest results from the European project LOMID will be presented. This project aims to develop high resolution, bendable OLED microdisplays that can be produced at low cost. In particular, Virtual Reality applications will be addressed by the new functionalities of the microdisplay.

National Funded Project "Glass@Service" – An Approach to Interactive Personalized Visualization in Industry Processes with Smart Glasses

Christian Wegener, Siemens AG, Germany

In an increasingly globalized world the industrial production faces completely new challenges. Those are caused, on one hand, by different production locations and its coordination and distribution. On the other hand, increasingly complex products and services require approaches which go considerably beyond the existing and established ways.

Currently, the national funded project "Glass@Service" different aspects shall be examined and implemented. One of the main targets is the development of personalized information systems in form of data glasses, which allow for a better and closer connection between the employee and the production process. This shall lead to considerably improved working conditions by their use in the factory of the future. Besides the increase productivity and prevention of human errors, the aspect of higher flexibility and diversity of workable processes leads to new approaches in industry process planning and implementation of the human-machine-interfaces.

One of the main technical features in this project is an intelligent smart data glass with new miniaturized near-to-eye displays and further sensor capabilities, as well as new interacting potentials (eye- and gesture controls) and innovative IT-services. Further aspects are the presentation of a new eye-tracking implementation concept, the realization of an innovative micro-display and the achievement within different applications in two different production sites of Siemens.

Atomized scan strategy for high definition OLED microdisplay

Wendong Chen, Shanghai University, China

We present a full digital atomized scan strategy for the high refresh rate OLED microdisplay. The mathematical model of the scan strategy is built. The experiment results show that the display frame rate of the FHD resolution can reach above 110Hz when the clock frequency is below 100MHz.

InP-based Quantum Dots for highly efficient solution based QLEDs

Dr. Armin Wedel, Fraunhofer IAP, Germany

Colloidal quantum dots (QDs)-based light-emitting diodes (QLEDs) has been actively researched due to the potential impacts to the display and lighting industry base on the unique properties of QDs itself such as size-dependent bandgap tunability, narrow emission spectrum, and low-cost solution-based processing. The performance of QLEDs has been increased enough to compete with phosphorescent OLEDs (PHOLEDs) by the combination of various device structure and efficient emitting materials. However, the most of promising results used cadmium (Cd) contained II-VI semiconductor nanocrystals. Therefore, a considerable future task is to substitute Cd-containing QDs with less toxic materials. InP-based QDs is a promising material among the III-V semiconductor nanocrystals and it has been already applied in conventional and inverted QLED structure. Here, we investigated the performance of inverted QLEDs fabricated with synthesized InP/ZnSe/ZnS QDs and ZnO NPs in terms of charge carrier balance.However, the performance of QLEDs based on InP QDs still need lots of improvements. Since organic-inorganic hybrid structure has more possibility to get high efficiency, zinc oxide (ZnO) nanoparticle (NP) has a lot of attention as electron transport layer with the advantage of material stability, high electron mobility and easy preparation process.

KEYNOTE

AMOLED Displays - A Review of Device-Circuit Interactions and Compensation Techniques

Prof. Arokia Nathan, University of Cambridge, UK

Recently, the use of templates for the submission of abstracts, extended abstracts or full papers to conferences has become standard procedure. The advantage is that the visual appearance of the proceedings of such a conference is more uniform, which makes them easier to navigate. It also makes the job of the editor of these proceedings easier.

This paper reviews the importance of device-circuit interactions (DCI) and its consideration when designing thin film transistor circuits and systems. We examine temperature- and process-induced variations and propose a way to evaluate the maximum achievable intrinsic performance of the TFT. This is aimed at determining when DCI becomes crucial for a specific application.

INVITED

Display technologies – Where is the EU?

Dr. Henri Rajbenbach, European Commisson, Belgium

The European Commission supports R&D on OLED and alternative display technologies since 2004. The presentation will provide an overview of R&D on displays in the H2020 framework programme, emphasizing on industrial-academic cooperation and support to SMEs. Trends on wearables and flexible will be outlined. Success stories and future funding opportunities will also be presented.

Electron Beam Micropatterning and Thermal Processing of Organic Light Emitting Devices

Elisabeth Bodenstein, Fraunhofer FEP, Germany

A micropatterning method for organic light-emitting diodes (OLEDs) by means of an electron beam process is presented. Depending on electron dose the process leads to a degradation mechanism in the organic material or a thermal removal. Subsequent thermal annealing allows to compensate degradation effects, improve the OLED performance and tune optical and electrical properties.

INVITED

GaN LED micro-displays for digital and structured lighting applications

Prof. Martin Dawson, University of Strathclyde, UK

High-density arrays of micro-pixel gallium nitride inorganic light-emitting diodes can be successfully bonded to CMOS electronic driver arrays to provide pattern-programmability and high-speed modulation. We overview the capabilities and potential of this technology for a range of digital and structured lighting applications.

GaN-based Emissive Microdisplays: a Very Promising Technology for Augmented Reality Systems

Dr. Francois Templier, CEA-Leti, France

GaN-based emissive microdisplays are key components for emerging augmented reality systems, since they provide very high brightness. They can be fabricated with different approaches which are reviewed. Brightness above 1 million nits is reached. More recently we have proposed a new technology which allows very small pixel pitch.

LEDs for Augmented Reality Near-to-Eye Displays

Dr. Stefan Morgott, Osram Opto Semiconductors GmbH, Germany

We show a LED concept optimized for augmented reality near-to-eye displays. The LED consists of various chips emitting in red (R), green (G) and blue (B) color for illuminating a sequential color microdisplay panel. The LED is optimized for various panel sizes by using certain configurations of the size, the number and the geometrical arrangement of the chips. We also give an outlook how to further minimize the package size and maximize the optical coupling efficiency into the system.

ABSTRACTS | POSTER

(Poster will be available on Monday and Tuesday)

Characterization and Modelling of Tandem structure OLED

Hanning Mai, University of Edinburgh, UK

This paper demonstrates a new SPICE equivalent circuit model for tandem structure organic light-emitting diodes (OLEDs). Tandem OLEDs are developed using charge generation layers to connect multiple conventional OLEDs in series and exhibit high efficiency and long lifetime. The model is developed for active-matrix-display driver circuit design.

High-resolution OLED Patterning for Microdisplays

Dr. Matthias Schober, Fraunhofer FEP, Germany

For OLED microdisplays, high-resolution OLED patterning is one of the key challenges to be solved, in order to reach high brightness along with important display features such as high color-space coverage and high lifetime. We present our recent work on OLED micropattering including concepts of photolithography and ablation.

Pulse magnetron sputtering for pre-encapsulation and large area precision optical coatings

Dr. Daniel Glöß, Fraunhofer FEP, Germany

In this paper, deposition technology for pulse magnetron sputtering and examples with links to display applications are presented: Low damage sputtering for OLED pre-encapsulation, special antireflective coatings for the backlight of 3D displays and freeform coatings on large optical components.

FEF: Fast Ellipse Fitting in Real-World

Marcus Penzel, University of Applied Sciences Zwickau, Germany

Data glasses and wearables become more and more popular due to smaller and more affordable microchips. Currently there is no uniformly used HMI (Human Machine Interface) on HMD's (Head Mounted Display). Google for example uses voice commands [GOV16] and gestures [GOG16], others like TRIVISIO use mouse input [TRI16]. A more intuitive system, interpreting the users eye and thus not requiring any conscious input, is the main objective of eye-tracking. However high hardware prices, low available performance and inadequate accuracy made them unappealing until the 20th century.

Organic light-emitting diodes allow for active beam-shaping without additional optical elements

Felix Fries, Technische Universität Dresden, Germany

In this contribution, we show that organic light-emitting diodes (OLEDs) can be designed such that without any further external optical or movable parts, their emission profile can be switched between two operating modes. This switching happens in real-time in a purely electrically manner, opening the way towards completely new applications.

Integration of light functionality within textiles by flexible OLED lighting

Jan Hesse, Fraunhofer FEP, Germany

OLED on flexible substrates are well suited for an integration into wearable. There is an increasing demand for the integration of light emitting elements within textile. By the key features flexibility, light weight and also transparency OLED technology is a well suited approach therefore. Within this paper we present our approach for first application demonstrators.

Electrical properties of SAM-modified ITO surface using aromatic small molecules with double bond carboxylic acid groups for OLED applications

Prof. Siddik Icli, Ege University, Solar Energy Insitute, Izmir, Turkey

5-[(3-Methylphenyl)(phenyl)amino]isophthalic acid (5-MePIFA) and 5-(diphenyl)amino] isophthalic acid (5-DPIFA) organic molecules were synthesized to form self-assembled monolayer on indium tin oxide (ITO) anode to enhance hole transport from ITO to organic hole transport layers such as TPD. The modified surface was characterized by scanning tunneling microscopy (STM). The change in the surface potential was measured by Kelvin probe force microscopy (KPFM). Our Kelvin probe force microscopy (KPFM) measurements showed that the surface potentials increased more than 100 mV with reference to bare indium tin-oxide. The results show that the threshold voltage on OLEDs with modified ITO is lowered significantly compared to OLEDs with unmodified ITO. The hole mobility of TPD has been estimated using space-charge-limited current measurements (SCLC).

The Personal Reader: A New Way to Read

Avram Shlemeh Adler, Personal Reader Project, Israel

IS DESIGNED to do for book reading what the Walkman™ iPod™ & iPhone™ have done for listening. The new 2.5 oz, wearable viewer should be of great value to book lovers, scholars and students - anyone who'd enjoy reading with their eyes relaxed, both hands free, inside a sleeping bag, without disturbing others or "off the grid". This includes readers in poorer countries. It should also be of special benefit to older readers, the bedbound, survivalists, mechanics and the military. Unlike the iPad™ & eBook readers, the Personal Reader may be used on the Sabbath by religious Jews.

A novel IPS-VA pixel architecture for phase modulation and beam-steering application

Clément Abélard, CEA-Leti, France

A new architecture of pixel allowing 2π phase modulation has been modelled. We can obtain a sawtooth index profile by multielectrodes addressing generating an in plane electric field (IPS) orienting vertically-aligned (VA) liquid crystals. Moreover, elevated electrodes reduce the disclination lines which often appear with a VA configuration.

The LOMID H2020 project for large microdisplays

James Whitby, Amanuensis GmbH, Switzerland

LOMID is a European Union H2020 R&D project to develop larger high resolution microdisplays and novel optical systems for use e.g. in head-mounted VR displays. This poster complements the talk on Tuesday morning by Beatrice Beyer; at the poster, we will summarize our progress, and show demonstration hardware (displays and compact viewing systems).

OLEDs on CMOS Automated Encapsulation Cluster

Jens Drechsel, CreaPhys GmbH, Germany
Wolfgang Ganter, M. Braun Inertgas-Systeme GmbH, Germany

- Integrated spincoater, inkjet, hotplates, UV-Curing
- Fully automated processing of 8" CMOS wafers
- Interface to all commercially available ALD tools
- Interface to vacuum cluster tool
- Class ISO 2 inertgas environment

Electron Beam Micropatterning and Thermal Processing of Organic Light Emitting Devices

Elisabeth Bodenstein, Fraunhofer FEP, Germany

A micropatterning method for organic light-emitting diodes (OLEDs) by means of an electron beam process is presented. Depending on electron dose the process leads to a degradation mechanism in the organic material or a thermal removal. Subsequent thermal annealing allows to compensate degradation effects, improve the OLED performance and tune optical and electrical properties.

Ultraviolet Laser Separation of Flexible Devices

Ralph Delmdahl, Coherent LaserSystems GmbH & Co. KG, Germany

The combination of modern excimer lasers, being the most capable in the UV-laser landscape, with large-field projection optics bridges the long-standing gap between "fast processing" and "precise processing" due to an unprecedented effective illumination footprint, some 10,000 times larger than the achievable resolution.

GLASS @ SERVICE

Joint Project "Glass@Service"

Interactive personalized visualization in industrial processes as part of Digital Factory in electronics manufacturing

Objectives:

- Integration of interactive smart-glasses into Digital Factory environment and processes
- Higher quality, error reduction/-prevention by augmented-reality (AR) technology
- Higher flexibility, diversity of manufacturing processes
- User acceptance, ergonomics, employee motivation
- Higher productivity
- Improved training

www.glass-at-service.de

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

DLR Projektträger

Funding reference: 01MD16008C

Consortium:

SIEMENS Coordinator

UBiMAX Ubiquitous Computing Experts

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DIOPTIC

baua: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin

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