Welcome Message
from the Conference Chair

C.I. Wu

Conference Chair of tSSL 2018
Vice President and General Director
Electronic and Optoelectronic System Research Laboratories, ITRI

On behalf of the organization committee, I would like to take this opportunity to formally welcome you to the 2018 Taiwan Solid State Lighting Conference (tSSL). The two-day event, featuring a number of keynote sessions and technical talks, gathers industry professionals and researchers in the field of solid state lighting from around the globe.

tSSL has continuously aimed for discussion on state-of-the-art progresses from different angles such as innovative applications and advanced technologies. Overall, the highlights of the 12th annual tSSL are OLED lighting, intelligent lighting systems as well as Micro LED and IR/UV LED. We are delighted to have representatives from leading companies and elite institutes to deliver insights on the latest trends in the area of lighting. We anticipate to create an informative networking platform for all of our participants.

Over the past decade, tSSL has successfully drawn the participation of over 3600 attendees from all over the world, and a total of 16 countries are closely involved with the tSSL community to discuss the latest advances in this vibrant and constantly evolving field.

Thank you for your support and attendance. I sincerely hope that all of the participants find this conference stimulating, fulfilling and enjoyable. I wish you a pleasant experience at tSSL 2018 in Taipei.

Sincerely,

Chih-I Wu, Ph.D.
Chair of 2018 tSSL
General Director, EOSL, ITRI

Agenda

Wednesday April 25th

Keynote Session - I : Emerging Lighting

Session Chair：蘇炎坤 Yan-Kuin Su (President, Kun Shan University)

09:00 - 09:20	**Opening**	**Welcome and Opening Remarks** Dr. C.I. Wu, Conference Chair of 2018 tSSL
09:20 - 10:10	**KI-1**	**The Strategic Roadmap and Actions for Lighting** Jan W. Denneman, External Relations / Past President, Global Lighting Association, Netherlands
10:10 - 11:00	**KI-2**	**OLED Lighting – Experience Light Better!** Giana M. Phelan, Director, Business Development, OLEDWorks LLC, U.S.A.
11:00 - 11:20		**Coffee Break**
11:20 - 12:10	**KI-3**	**Quantum Materials, the Competitors or the Partners of uLED Displays** Joe Lin, Head of Business Development, OLED & QM, Merck Performance Materials Ltd., Taiwan
12:10 - 13:30		**Lunch Break**

Session A : Advanced Technologies - I

LED Session

Session Chair : 洪瑞華 Ray-Hua Horng (Distinguished Professor, Institute of Electronics, National Chiao Tung University)

13:30 - 14:00	**A-1**	**Fabrication of High-Quality AlN on Sapphire for Deep UV LED** Hideto Miyake, Professor, Mie University, Japan
14:00 - 14:30	**A-2**	**An Update on Color Tunable Luminaires and Time Varying Illumination Content** Steve Paolini, President, Telelumen LLC, U.S.A.
14:30 - 15:00	**A-3**	**Solving the Gordian Knot of Connectivity** Mathias Burger, Independent Speaker, Austria
15:00 - 15:20		**Coffee Break**

OLED & Micro LED Sessions

Session Chair : 林建中 Chien-Chung Lin (Division Director, Industrial Technology Research Institute (ITRI))

15:20 - 15:50	**A-4**	**Current Status and Issues on OLED Lighting for the Auto Mobile Applications** Takuya Komoda, Ph.D., CEO, FLASK Corporation & Professor, Yamagata University, Japan
15:50 - 16:20	**A-5**	**Development of PixeLED Display and Future Challenges** Yun-Li (Charles) Li, Ph.D., CEO, PlayNitride Inc., Taiwan
16:20 - 16:50	**A-6**	**Toward Business Launch for OLED Lighting** Toshihiko Iwasaki, General Manager, Konica Minolta Pioneer OLED, Inc., Japan

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Keynote Session – II : Emerging Lighting

Session Chair：許千樹 Chain-Shu Hsu (Chair Professor, National Chiao Tung University)

09:00 - 09:50	**KII-1**	**Islands of Intelligence in Human Optimized Homes** Christos Malavazos, Co-Founder & CTO, Grindrop Limited, United Kingdom
09:50 - 10:40	**KII-2**	**Fundamental Issues in Micro LED Chips and Related Displays** Dong-Sing Wuu, Lifetime Distinguished Professor, National Chung Hsing University, Taiwan
10:40 - 11:00		**Coffee Break**
11:00 - 11:50	**KII-3**	**Printable OLED Material and Its Application to Lighting Panel Fabrication** Takeshi Yamada, General Manager, PLED Business Planning Office, Sumitomo Chemical Co., Ltd., Japan
11:50 - 13:30		**Lunch Break**

Session B : Advanced Technologies - II

OLED Session
Session Chair : 陳方中 Fang-Chung Chen (Professor, Department of Photonics, National Chiao Tung University)

13:30 - 14:00	**B-1**	**Thermally Stable Organic Transporting Materials for OLED Lighting Applications** Eric Chang, Chairman, e-Ray Optoelectronics Technology Co., Ltd., Taiwan
14:00 - 14:30	**B-2**	**What OLED Holds for the Future of Lighting** Sebastian (Sae-Woong) Suh, Manager, LG Display, Korea
14:30 - 15:00	**B-3**	**Design Thinking of OLED Design** Meng-Cong Zheng, Associate Professor, Department of Industrial Design, National Taipei University of Technology, Taiwan
15:00 - 15:20		**Coffee Break**

Micro LED & IR/UV Sessions
Session Chair : 武東星 Dong-Sing Wuu (Lifetime Distinguished Professor, National Chung Hsing University)

15:20 - 15:50	**B-4**	**Full-Color Micro-Light-Emitting-Diode Display Based on High-Quality Quantum-Dot** Hao-Chung (Henry) Kuo, Distinguished Professor, Department of Photonics and Institute of Electro-optical Engineering, National Chiao Tung University, Taiwan
15:50 - 16:20	**B-5**	**Measurement of VCSEL and UV-LED** Andreas Kreisel, Application Engineer, Instrument Systems GmbH, Germany
16:20 - 16:50	**B-6**	**Explore Unlimited Possibilities with Optoelectronics - IR LED & LASER** Sander Su, Senior Director, SBG OFFICE (G. Marketing & EBO), LITE-ON TECHNOLOGY CORP./ Optoelectronics Product Solution SBG, Taiwan

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Jan W. Denneman
External Relations / Past President
Global Lighting Association
Netherlands

Topic

The Strategic Roadmap and Actions for Lighting

Abstract

The Global Lighting Association has created its Strategic Roadmap for the global lighting industry.

In recent decades the world has seen enormous changes in lighting. The industry has witnessed two highly disruptive technology developments. Light emitting diodes (LEDs) from quality producers have developed to a level of performance and light quality to enable the rapid replacement of most conventional light sources. Secondly, LEDs have been integrated into intelligent lighting systems, making them capable of full integration with the digital world. Consequently the industry is now moving towards system solutions, in addition to better lighting quality than that previously offered by traditional technology.

A 3rd photo-receptor in the human eye has been discovered, providing scientific evidence that light not only enables vision, but also impacts performance and feelings of well-being. This enables lighting to add value to society from sustainability to quality of light.

The world has many challenges, and some are very relevant to the lighting industry. These include the challenges posed by globalization, climate and demographic changes.

The challenges confronted by the lighting industry are digitalization, new applications of intelligent lighting systems and the increasing demand for buildings supporting human health, well-being and productivity. Hence the value of lighting is moving from energy efficiency to the wider spectrum of quality of life and improved well-being.

This transition requires new paradigms for all stakeholders – the industry, customers and users and particularly governments and regulators, who need to view the capabilities and benefits of lighting within this wider context.

Biography

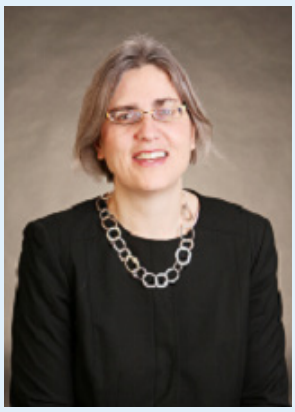
More than 40 years Jan has been working for Philips Lighting in several roles within product development, business development, product management, marketing and sustainability.

In 2001 he became a member of the Board of Directors and President of the European Lamp Companies Federation - the major discussion partner for the European Union on all issues concerning light sources. In 2015, he was elected as **President of Lighting Europe.**

Because the huge changes in the lighting world of LEDs and Connectivity require also new approaches in standardization, he took the initiative to create new alliances like **Zhaga** and **The Connected Lighting Alliance** in which he serves as Board member.

In 2007 Jan took the initiative to create the Global Lighting Forum and in March 2012, he has been elected as **President of the Global Lighting Association**, a cooperation between peak lighting industry associations worldwide, like CALI, NEMA, LightingEurope, ELCOMA, JLMA, Lighting Council, TLFEA, ABILUX, KILT, MELA etc.

Since 2018, Jan acts as an ambassador for Human Centric Lighting and he is responsible for the External relations of the Global Lighting Association.



Giana M. Phelan
Director, Business Development
OLEDWorks LLC
U.S.A.

Topic

OLED Lighting – Experience Light Better!

Abstract

When people first experience OLED lighting they have a positive emotive response to the beauty of the light quality. The light draws them in and they want to engage in a light that feels good to them. Designers call the light quality pure and honest. This is the challenge of OLED lighting. As a newcomer in an established market, OLED lighting is more expensive and trails the impressive specifications of its sister solid state lighting technology, LED. However, that is changing quickly as performance gains continue to be impactful and costs continue to decline. OLEDs now meet many application requirements and the number of fixture makers looking to develop OLED products is rapidly growing. In addition, as OLED blurs the line of luminaire and lighting engines, contractors are considering custom installations of OLEDs as a tile or building material. Furthermore, OLEDs are a healthy light option for eye, skin and circadian rhythm well-being. Recently the US Department of Energy published a Gateway study on OLED in an office application. This talk will share these results as well as discuss the economic, design and technical challenges and human response to adopting this new technology.

Biography

Giana Phelan is currently Director of Business Development at OLEDWorks LLC, an OLED lighting technology and manufacturing company. In this position she collaborates with a highly varied customer mix including luminaire designers, furniture makers, automobile manufacturers, contractors and architects to accelerate OLED lighting adoption. Ms. Phelan has over 25 years' experience in developing and commercializing complex microelectronic systems including OLED, MEMS, microelectronic packaging and nanophotonics applications at IBM and Eastman Kodak. At Kodak Ms. Phelan was program manager of the OLED solid-state lighting programming during which time she set intellectual property and research and development strategy through market research, business analysis and commercialization technology gap analysis. Under her management, the team was awarded three Department of Energy EERE core research awards. Ms. Phelan has held numerous leadership roles including Photonics Research Department Head and Product Development department manager for MEMS print head technology where she was responsible for transferring design, process and product technology through commercialization and product launch. Ms. Phelan holds a Master's Degree in Product Development from Rochester Institute of Technology and a MS in Chemical Engineering from the University of Virginia. Ms. Phelan holds sixteen (16) US patents.

Joe Lin
Head of Business Development, OLED & QM
Merck Performance Materials Ltd.
Taiwan

Topic

Quantum Materials, the Competitors or the Partners of uLED Displays

Abstract

For better profit margin potential, the market sees the opportunities, to move LED technology from lighting applications to display applications, by developing uLED displays. uLED displays are wanted, with the potential benefits of low power consumption, high brightness, high resolution, and so forth.

To reduce the mass transfer complexity of millions tiny uLEDs, blue uLED + color converter, is one of the technology options, to realize RGB displays. Quantum materials (QM) are recognized as good color converting materials, because of its nanometer size. However, to pattern quantum materials on pixel level is not easy, photo patterning with photoresist and inkjet printing, are currently the pixelized process options. Not only quantum material development, Merck is devoting itself in quantum material process formulation R&D, and as you may expect, different challenges are facing.

To simplify further the display device architecture, and to optimize the cost structure further, Electro Luminance Quantum Dot Light Emitting Diols (EL QLED), a self-emission display technology is also under development. Merck cooperates with market partners and is sponsored by German government for the basic EL QLED study.

Therefore, quantum materials are supporting uLED display, as a color converter. Quantum materials are also feasible to structure self-emission displays. How soon we can see the new display technology commercialization? Unfortunately, none knows. Yet we can witness together, the technology evolution.

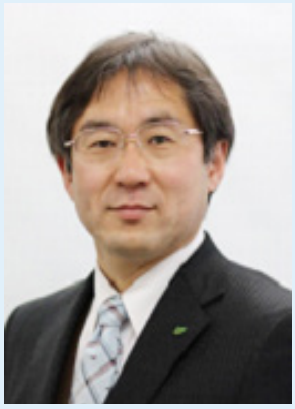
Biography

Mr. Joe Lin is currently the Head of Business Development, OLED & QD material, in Taiwan.

Since 2002, Lin joined Merck, starting with Liquid Crystal marketing and sales, and leading the team to serve Taiwan LCD industry. From 2011, Lin is assigned to develop OLED businesses in Taiwan and China. In 2016, Lin started again the new technology business development tasks, to look for technical applications and business opportunities of Quantum Materials and uLED.

Joe Lin completed his bachelor's degree in Chemical Engineering in Tunghai University, Taiwan, and Master degree in Strategic Management in Waikato University, New Zealand.

Joe Lin is reached via joe.lin@merckgroup.com



Hideto Miyake
Professor
Mie University
Japan

Topic

Fabrication of High-Quality AlN on Sapphire for Deep UV LED

Abstract

The annealing of sputtered AlN films with different thicknesses grown on sapphire in nitrogen ambient was investigated. In the annealing, two AlN films on sapphire were overlapped “face-to-face” to suppress the thermal decomposition of the AlN films. The sputtered AlN films with small grains consisted of columnar structure were initially aligned with (0002) orientation but became slightly inclined with increasing film thickness resulting in the formation of a two-layer structure. After annealing, films became a single crystalline layer regardless of the film thickness, and their crystallinity markedly improved after annealing at 1700 oC. The full widths at half maximum of the (0002)- and (10-12)-plane X-ray rocking curves were improved to 30-50 and 200-250 arcsec, respectively.

This work is partially supported by JSPS KAKENHI Grant Numbers 15H03556 and 16H06415, and JST CREST No. 16815710, JST SICORP InRel-NPower – EU H2020 No. 720527, and JST SICORP with MOST in China.

Biography

- *1986* M.E. in Electronic Engineering, Osaka University
- *1986* Research Associate, Department of Electrical and Electronic Engineering, Mie University
- *1994* Dr. E. in Electronic Engineering, Osaka University
- *1997* Associate Professor, Department of Electric and Electronic Engineering, Mie University
- 2001 Visiting Researcher in University of California, Santa Barbara
- 2007 Associate Professor, Graduate School of Engineering, Mie University
- 2015 Professor, Graduate School of Regional Innovation Studies, Mie University
- 2017 Dean of Graduate School of Regional Innovation Studies, Mie University

His research topics are Semiconductor Engineering, Epitaxy and characterization of III-nitrides and Optoelectronics.

Steve Paolini
President
Telelumen LLC
U.S.A.

Topic

An Update on Color Tunable Luminaires and Time Varying Illumination Content

Abstract

Electronic illumination luminaires have evolved along with solid state (LED and LD) sources by adding a computer and interface to traditional vacuum electric lamps and luminaires. With this computing resource additional independent color channels can now be synchronized to replicate any static or dynamic spectral power distribution. One important illumination source to replicate is daylight and its complex dynamic spectrum. Another complex source is fire. Beyond natural sources, designer spectrum can now be synthesized for retail and healthcare applications. This talk will explore important features of color tunable luminaires and the software that operates them. Summary information from a database of spectrometer recordings of daylight from around the world will also be discussed.

Biography

Steve joined Hewlett Packard, Optoelectronics Division in 1981. While at HP he held a variety of engineering and management positions in California, Japan, and Malaysia. In 2000 he joined Philips Lumileds as a founding member. In 2007 he founded Telelumen, where he is currently the President. He was also the CTO at Lunera Lighting and the CTO of NEXT Lighting. He speaks frequently on a variety of topics related to solid state lighting and holds 21 issued patents.

Mathias Burger
Independent Speaker
Austria

Topic

Solving the Gordian Knot of Connectivity

Abstract

The advent of the Internet of Things, connectivity in general and digitization of business as forming the next big transformation of the lighting industry, if not even the biggest. It is a challenge as well as opportunity and will evolve and partly disrupt the existing market.

In order to be prepare for this endeavor companies need to develop and deploy their own connectivity strategies. It is often overseen that the digital transformation of the lighting industry is not just about the development of new products but requires a holistic approach around partnerships, ecosystems, new target customers and business models – as well as the right company culture and mentality to succeed.

While this speech is not providing a universal solution to this challenge, it tries to provide at least a proper framework on which companies can build their individual strategies as well as some real world experiences and best practices.

Biography

Mathias Burger studied economics with focus on technology and innovation management at the Technical University in Munich. After his degree in 2008, he spent his first years in the Entertainment lighting industry, joining Martin Professional as Product Manager.

In 2011, Mathias Burger joint Tridonic as Product Manager for the LED driver business, driving the strategic transformation of Tridonic into a respected player in the LED world. After further positions as System Architect and Program Manager, he finally joint May 2016 the Tridonic Management Team as Direct Product Management, being responsible for the connectivity domain and digital strategy.

Beginning 2018 he left Tridonic in order to pursue a new career outside Tridonic.

Takuya Komoda

Ph.D., Chief Executive Officer(CEO), Flask Corporation
Professor, Yamagata University
Japan

Topic

Current Status and Issues on OLED Lighting for the Auto Mobile Applications

Abstract

OLED for lighting application is getting popular and especially it is employed in the field of luxurious environmental lighting because of its excellent color reproduction and soft intensity to the eye.

Recently a lot of studies are conducted in order to apply OLED to the automobile applications. OLED is very light weight and can be flexible and its potential of the design freedom is able to give vehicle designer vast inspiration. However, among the engineers, it was thought that OLED would not be suitable for Automobile applications because of its severe environmental condition. Recent research revealed that it is possible for OLED to adopt those applications by choosing the materials, device structure and encapsulation technologies.

Some leading car manufacturers such as Audi and BMW are already installed OLED lighting panels for their tail lamp system. Such a trend would become popular among other car manufacturers and OLED would apply very rapidly to other automobile application areas such as an interior and an exterior use.

There are still issues to solve in order to apply OLED widely to the car and in this presentation, those issues and possible solutions will be presented.

Biography

Takuya Komoda joined Panasonic Electric Works Co. Ltd. (now Panasonic Corporation) in 1978. He was working on silicon semiconductor process and device design technologies. From 1991 to 1997, he directed the UK laboratory in the United Kingdom and conducted the research on nano-crystalline silicon and its visible light emission properties. In 1997, he received Ph.D. from the University of Surrey, Guildford, UK.

From 2007 to 2014, he was the project leader of the NEDO (Japanese public R&D management body) project regarding “the Development of Next Generation High Efficient and High Quality OLED Lighting”. He was also the Research Director of the Eco Solutions Company of Panasonic Corporation.

He retired Panasonic in July 2015 and he joined Yamagata University as a professor from October. In April, 2017, he founded FLASK Corporation and he is playing an active part as the CEO.

He is now teaching Yamagata University. In addition, he is also a Visiting Professor of Osaka University and Tokyo University of Agriculture & Technology. He is also an independent business and technical consultant for some companies and ministries.

Yun-Li (Charles) Li
Ph.D., CEO
PlayNitride Inc.
Taiwan

Topic

Development of PixeLED Display and Future Challenges

Abstract

PixeLED™ display is a technology based on MicroLED, which has high brightness, wide color gamut, high aperture ratio, and best reliability. In additional to traditional display applications, PixeLED™ display can be used for innovative display technology, such as transparent display, sports watch, ultra large size cinema, automotive, and many new display scenarios.

Biography

Dr. Yun-Li Charles Li received his Ph.D. degree from Rensselaer Polytechnic Institute (USA) with Prof. Fred Schubert in 2003. Dr. Li's Ph. D. work focused on gallium nitride (GaN) light-emitting devices and solid state lighting applications.

Dr. Li is currently CEO and co-founder of PlayNitride, Inc., a company provides ODM services of PixeLED™ technology for next generation display industry. PixeLED™ technology can be applied for high performance displays with very high resolution, high contrast ratio, fast response, and very low power consumption.

PlayNitride's vision is to be the highest-efficiency component provider to display companies, and in partnership with them, to realize next-generation, high-performance display technology.

Toshihiko Iwasaki
General Manager
Konica Minolta Pioneer OLED, Inc.
Japan

Topic

Toward Business Launch for OLED Lighting

Abstract

• Introduction of joint venture company, KONICA MINOLTA PIONEER OLED (KOMPO)
• Big-picture view of KOMPO's activity
• Efforts for OLED lighting business development in 3 fields

Biography

Toshihiko Iwasaki joined Konica Corporation (current Konica Minolta), Tokyo Japan in 1990 after his receiving M.S. degree in Chemical from Tokyo University of Science. He has been engaged in research and development of OLED since 2006. Later, on June 1, 2017 he joined Konica Minolta Pioneer OLED, Inc., the joint venture for OLED lighting business. His current focus is the development of flexible OLED products for automotive applications.

Christos Malavazos
Co-Founder & CTO
Grindrop Limited
United Kingdom

Topic

Islands of Intelligence in Human Optimized Homes

Abstract

Traditional "Lighting-as-a-Commodity" business models are challenged by new ICT entrants and fast emerging "as-a-service" models. In addition, conventional lighting systems still lack true intelligence, context-awareness and self-learning ability to offer the flexibility desired by different users and varying ambient conditions.

Human-computer integration is inevitable and is driving the future of all almost all known market sectors. Intimate ambient and body area sensors will allow us to continuously analyze and convey insight about our habits and preferences and co-opt major lifestyle changes. Sensor fusion and machine learning should become an inseparable part of future offerings allowing us to explore the vast amount of abundantly available information and re-invent the way we interact with our surroundings. Lighting will become a synchronized component of our smart homes that adapts to our personal profiles, needs and comfort preferences.

We are presenting **Uelo** (www.uelo.io), a multi-sensing smart home solution linked with a powerful cloud-based IoT framework, offered in the form of Wellness-as-a-Service. It leverages the profound physiological (visual & non-visual) implications of human optimized lighting and adaptive thermal comfort, assisting in the regulation of our biological clock, enhancing emotions, cognitive performance and comfort while safeguarding health and well-being. Homes become active living environments, continuously adapting to our personal needs by proactively offering optimal ambient (visual & thermal) conditions.

Uelo is built on the experiences of DOME, a lighting-as-a-service prototype framework and the findings of an earlier experiment involving over 10 thousand users. Uelo is currently undergoing extensive pilot tests in diverse building environments.

Biography

Dr. Christos Malavazos studied Electrical & Computer Engineering at the National Technical University of Athens and received his Ph.D. in Machine Learning and Multilingual Knowledge Management. He spent his early career years as a software engineer at the Institute of Communications & Computer Systems (www.iccs.gr/eng/) and later as a researcher at the Institute for Language & Speech Processing (www.ilsp.gr/en) working on Semantic Technology Applications. From 2002 to 2008 he served as the head of the IT Unit of TREK Consulting (www.trek.gr) leading large scale IT projects. In 2009 he established the Hypertech Energy Labs Unit (www.ht-energylabs.com/) and acted as member of the company board and unit director until 2014, leading multi-million research activities at the intersection of IoT & Smart Grids and delivering cutting-edge Demand Side Management solutions for Consumers and Utilities that received the highest rank at various EU competitive R&D frameworks.

In 2014, Christos co-founded Grindrop (www.grindrop.com/). Grindrop is a London based startup, that brings into the market a revolutionary Lighting as a Service (LaaS) solution that offers a truly human centric and ambient building automation experience for homes & offices, redefining the way people interact with their buildings and buildings interact with the grid.

Dong-Sing Wuu
Lifetime Distinguished Professor
National Chung Hsing University
Taiwan

Topic

Fundamental Issues in Micro LED Chips and Related Displays

Abstract

Micro LED is an emerging display technology which received tremendous attention in recent years. It possesses several advantages such as low power consumption, high brightness and high resolution. The micro LED will be the main stream of future small-size, high-resolution displays for vehicles, wearable devices, and augmented/mixed reality (AR/MR) applications. However, the development of the micro LEDs still has several key issues to be overcome. It is well known that the leakage current increases with the shrinkage of LED chip size due to the proportional edge defect effect. This will increase the noise level and affect the image quality. Unlike the conventional power LEDs with high efficiencies (>70% @15-30 A/cm^2), the external quantum efficiency (EQE) of the micro LED operated at the low injection current densities (< 1 A/cm^2) is extremely low. This will result in the increment of the power consumption which is very sensitive to the wearable devices. So far, the micro LED technology cannot reach the specification of the AR/MR requirements, i.e. ≥2000 PPI and ≥20K nits. Furthermore, how to mass transfer the micro LED chip arrays with high production yield is another tough challenge. In this talk, some fundamental issues in micro LED chips will be discussed. A demonstration of passive circuits integrated with micro-LED chips is developed and improved for blue and red micro-display applications.

Biography

Dong-Sing Wuu received the B.S., M.S., and Ph.D. degrees from National Sun Yat-Sen University, Taiwan, in 1985, 1987, and 1991, respectively, all in electrical engineering. From 1991 to 1995, he was involved in the field of integrated optics and ink-jet print heads in Industry Technology Research Institute, Taiwan. In 1995, he joined the Department of Electrical Engineering, Da-Yeh University, Taiwan, as an Associate Professor. He moved to National Chung Hsing University (NCHU), Taiwan, as a Full Professor with the Department of Materials Science and Engineering since 2001.

Prof. Wuu has published over 270 SCI Journal papers, and over 200 International Conference Proceedings papers and 5 Book chapters. He has been crowned by steady advancements where he has received the Distinguished Research Award (in photonic field) in 2009, and the Excellent Technology Transfer Awards in 2007, 2010 and 2011, from the Ministry of Science & Technology (Taiwan). Dr. Wuu are currently the Fellows of OSA, SPIE, the Institute of Physics (FinstP), and the Institute of Engineering and Technology (FIET).

Takeshi Yamada
General Manager
PLED Business Planning Office, Sumitomo Chemical Co., Ltd.
Japan

Topic

Printable OLED Material and Its Application to Lighting Panel Fabrication

Abstract

I will present the latest status of high performance soluble-OLED material development, which is based on our proprietary conjugated-polymer technology. Recently we made a good progress for the materials used for OLED display. Now we are in parallel developing the materials for OLED lighting, where we can apply our experience of display material development. We are also focusing on device and process development for the lighting panel by ourselves. Our aim is to fabricate lighting panel with low-cost and high-performance through Roll-to Roll printing technology. In the talk, I will discuss our simplified but efficient device structure and its physics, then will touch the latest status on the flexible lighting panel performance.

Biography

- *1992* Graduated from Kyoto University and obtained Master degree of polymer science.
- *1992* Entered in Sumitomo Chemical., Co. Ltd and belonged to Petrochemical R&D.
- *2002* After 10 years carrier in petrochemical experience, moved to polymer OLED material development division in Tsukuba laboratory.
- *2008* Had several experiences for the merger of Dow's OLED and CDT's acquisition, became a project manager of OLED material in Sumitomo.
- *2010* Began close relationship with several customers for the development of soluble-OLED display panel.
- *2017* Moved to Tokyo Head-office and became a general manager of PLED business planning office.

• *Background*

- Polymer thermodynamics and statistical mechanics, polymer physics.
- Organic electronics, OLED.

Eric Chang
Chairman
e-Ray Optoelectronics Technology Co., Ltd
Taiwan

Topic

Thermally Stable Organic Transporting Materials for OLED Lighting Applications

Abstract

The evolution of the OLED lighting from some specific indoor decorating lighting to outdoor automotive lighting has been ongoing. Focusing on developing thermally stable materials as the core technology, e-Ray Optoelectronics Technology Co. Ltd. has developed many high glass transition temperature OLED materials to satisfy thermally stable requirements. The latest e-Ray's proprietary hole transporting materials exhibit high glass transition temperature, low driving, and high durability under high temperature condition test. The latest e-Ray's proprietary electron transporting materials also exhibit high glass transition temperature, good device efficiency, and high durability under high temperature condition test. In this talk, I will introduce the recent e-Ray's recent strategy, technologies and milestone based on OLED materials and their performance and applications.

Biography

Dr. Chang was born in 1965. Upon completing his doctorate degree at the Department of Chem. Eng. & Polymer science in Polytechnic University in Brooklyn, New York (now New York University Tandon School of Engineering) in 1996, he returned to offer Taiwan his services.

In 1997, Dr. Chang joined the Industrial Technology Research Institute's (ITRI) Chemical Engineering Research Laboratories and developed OLED/PLED material technology.

In 2001, Dr. Chang joined e-Ray Optoelectronic Technology Co., Ltd. as the company's one of co-founders and deputy General Manager. e-Ray is primarily involved in the development and production of organic light emitting materials for OLED panels. Dr. Chang filed several OLED materials patents in Taiwan, USA, Korea, etc.

In 2012, Dr. Chang joined ITRI's Industrial Economics and Knowledge Center (IEK). He involved in the field of OLED industry trend research. He has published several dozens of industrial research reports on various OLED technologies and product development in the applications for display and lighting.

Dr. Chang joined e-Ray again in 2017. Now, He is the company's Chairman.

Sebastian (Sae-Woong) Suh
Manager
LG Display
Korea

Topic

What OLED Holds for the Future of Lighting

Abstract

From the advent of artificial light, lighting has gone through several stages of change. As the focus of electric light shifted to 'efficiency' in recent years, LEDs provided a viable solution despite certain challenges regarding blue light, glare and the like. More recently, there has been a shift in development aiming to resolve these issues, and we are seeing a significant increase on marketing messages that revolve around light quality.

OLED as a light source possesses numerous advantages that can contribute to these trends. Some of the better known OLED characteristics include low glare, diffused shadows, low heat emission. In addition to these factors, several tests in Korea have revealed that using OLEDs can reduce the level of optical damage normally caused by conventional light sources. For instance, using OLEDs for reading resulted in lower levels of inflammatory cytokine which causes eye strains. Other test results show that there can be less retinal cell reduction with OLEDs when compared to other light sources.

With these benefits in mind, constant efforts are being made to facilitate the expansion of OLED light into the mass market. Most notably, LG Display has invested in a Gen 5 production line, and is currently gearing up for mass production in 2018. The new production will include the long awaited flexible OLED light panels. LG Display had also launched a collaboration program in 2017 to help architects and designers realize their creative vision with OLEDs. LG Display has plans to relaunch the program this year.

Biography

- *Education*
  - *2003 ~ 2005* **Fudan University**, China / MBA (MIT Sloan)
  - *1995 ~ 1999* **Korea University**, Korea / Management/Information Systems
  - *1997 ~ 1998* **Swinburne University**, Australia / Student Exchange Programme
- *Work*
  - *2015 ~ Now* **LG Display**, Korea / Senior Manager, OLED Light Marketing & Sales Team
  - *2005 ~ 2015* **LG Chem**, Korea / Senior Manager, OLED Light Marketing & Sales Team
    New Business Development Team / IT & Electric Materials Co.
    Strategic Planning Team / IT & Electric Materials Co.
    Planning Team / Optical Materials Division
  - *2001 ~ 2003* **World Economic Forum**, Korean Office / Chief Strategist

Meng-Cong Zheng

Associate Professor
Department of Industrial Design,
National Taipei University of Technology
Taiwan

Topic

Design Thinking of OLED Design

Abstract

OLED is the future of lighting. How to express the lightness of OLED is one of the design topics under the existing size constraints. In this speech, I will introduce my past experience in designing with enterprise cooperation from an aspect of human-machine-environment, including my recent achievements in design psychology. Based on these experiences and research findings, I will introduce the mistakes and problems that often occur in the design process, and how to use these experiences to guide the design thinking into OLED design. Finally, I will share the OLED product design project with ITRI. See how we step by step from the problem definition, modeling experiments, assembly process to find a suitable design solution, to provide all participants in tSSL with future OLED design reference.

Biography

I obtained my doctorate in design science from Chiba University in Japan in 2008 and engaged in design related work for nearly ten years. Currently I am an associate professor in the Department of Industrial Design, Taipei University of Science and Technology, and chairs the Design Psychology Laboratory. Also, as a number of foreign design competitions, design journals, and government subsidy schemes program review committee. Research expertise is universal design, design psychology and usability evaluation. My lab team has been working with the enterprise on a number of product design projects for a long time. The content of the projects extends from the hardware appearance design to the UI/UX design of the user's internal experience. The project results also won many awards in well-known design competitions. We hope to explore the relationship between users, products, and environment, and provide a complete design solution for various industries.

Hao-Chung (Henry) Kuo

Distinguished Professor
Department of Photonics and Institute of Electro-optical Engineering,
National Chiao Tung University
Taiwan

Topic

Full-Color Micro-Light-Emitting-Diode Display Based on High-Quality Quantum-Dot

Abstract

A full-color emission red–green–blue (RGB) quantum-dot (QD)-based micro-light-emitting-diode (micro-LED) array with the reduced optical cross-talk effect by a photoresist mold has been demonstrated. The UV micro-LED array is used as an efficient excitation source for the QDs. The aerosol jet technique provides a narrow linewidth on the micrometer scale for a precise jet of QDs on the micro-LEDs. In order to reduce the optical cross-talk effect, a simple lithography method and photoresist are used to fabricate the mold, which consists of a window for QD jetting and a blocking wall for cross-talk reduction. The cross-talk effect of the well-confined QDs in the window is confirmed by a fluorescence microscope, which shows clear independence QD pixels. A distributed Bragg reflector is covered on the micro-LED array and the QDs' jetted mold to further increase the reuse of UV light. The enhanced light emission of the QDs is 5%, 32%, and 23% for blue, green, and red QDs, respectively.

Biography

- More than 20 years experience in the field of III-V optical devices/materials (GaAs, InP, GaN) MOCVD both in industrial and academic area. Familiar with both Veeco and Aixtron Reactor (Production and RD)
- Solid State Lighting Process Development- high power GaN LED using Laser Lift-off technology; GaN VCSEL using Laser lift-off and bonding technique; High power AlGaInP metal bonded LED; Power enhancement of LED performance using ODR and nanotechnology. Flip chip LED and thin film package, POD
- Familiar with fabrication and measurement of various quantum devices- QWIPs, VCSELs, Photonics Crystal devices, LEDs, Solar cell, HEMTs, MQW modulators
- IEEE JSTQE and Journal of Lightwave Technology Associate Editor
- More than 300 papers (8379 total citations and an H-factor of 42) in peer-reviewed journals
- IEEE Photonic Society Fellow 2015, IEEE Fellow 2014, OSA Fellow 2012, SPIE Fellow 2013, IET Fellow 2012
- *Education*
  - **Ph.D., UNIVERSITY OF ILLINOIS AT CHAMPAIGN-URBANA** / Department of Electrical and Computer Engineering, Dec. 1998
  - **M.S., RUTGERS UNIVERSITY AT NEW BRUNSWICK** / Department of Electrical Engineering (Electronics), May 1995
  - **B.S., NATIONAL TAIWAN UNIVERSITY, TAIPEI** / Department of Physics, May 1990
- *Work*
  - **08/2012 ~ Now** **Distinguished Professor**, *National Chiao-Tung University, Hsin-Tsu, Taiwan, ROC; Associate Dean, office of International Affair; Associate Director, Photonics Cbeter, NCTU*

Andreas Kreisel
Application Engineer
Instrument Systems GmbH
Germany

Topic

Measurement of VCSEL and UV-LED

Abstract

The improvement of UV LEDs and VCSEL (vertical-cavity surface-emitting laser) enables a large variety of new applications for example in the field of sensor technologies. This trend leads to an increased demand for these devices in future. The measurement of UV LEDs and VCSELs requires specific equipment and methods. Instrument Systems presents solutions how to measure UV-LEDs and VCSEL spectra with high accuracy and very fast at the same time.

Biography

- *Education*
  - Diplom Physicist
  - Julius Maximilians University Würzburg, Germany
- *Experience*
  - 3 years at Instrument Systems as Sales Engineer
  - 2 years at ZEISS as development Engineer

Sander Su

Senior Director / SBG OFFICE (G. Marketing & EBO)
LITE-ON TECHNOLOGY CORP. / Optoelectronics Product Solution SBG
Taiwan

Topic

Explore Unlimited Possibilities with Optoelectronics - IR LED & LASER

Abstract

In the new industry, LED is not only an illumination device, but also a functional product. LED stays in different form factors with different characteristics in several applications, which gives much new features in applications.

At the same time, IR LED get significant new roles in the industry, as well as IR LASER. It could create the new demand and market along with the technology upgrade of IR LED and LASER.

Biography

Head of SBG Office, OPS SBG, LITE-ON Technology Corp. (Global Marketing & New Business Development)

The committee of industry development, Taiwan Optoelectronics Semiconductor Industry Association.

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