OLED100.eu NEWSLETTER – JULY 2010

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International Summer School on "Organic Optoelectronics on the Move" Krutyn/Poland June 22-28, 2010

Sixty-seven students and lecturers combined to make the 5th International Summer School on OLED technologies, held in Krutyn, Poland, from 22 to 28 June 2010. The school was organised jointly by the European projects: OLED100.eu and Fast2Light. The programme focussed on technologies for high-efficiency materials and structures, technologies for improving life time, roll-to-roll printing on flexible substrates, and applications beyond basic lighting. To complement the technical presentations, there was a "soft skills" programme that treated topical subjects like Intellectual Property Development and Protection and a course on Design of Experiments.

Information exchange between students and lecturers was based on formal lectures, presentations by students, interactive poster presentations, expert consulting sessions, and a congenial atmosphere that promoted discussions and exchanges during meals and the social programme.

OLED100.eu - Fast2Light Summer School: 67 students and lecturers

Some major results of the school discussions are:

1. The OLED recombination region should be widened to reduce recombination at interfaces. Dr. Kido of Yamagata University promoted the idea of continuous grading from Electron Transport Layer to Hole Transport Layer.

2. OLED luminance at lighting levels should be achieved by a triple stack of OLEDs in series. This dramatically lowers current density and heating for a given level of luminance. Dr. Todt of the Fraunhofer IPMS said that this approach reduces the size of current distribution bus bars.

3. Search for efficient phosphorescent blue emitters based on $Ir(ppy)_3$ compounds may have reached a plateau. Peter Djurovich of USC said that he is looking elsewhere for efficient blue emitting materials.

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Lecture highlights:

Richard Kirk, Polyphotonix, Durham

Richard Kirk is CEO of Polyphotonix and an artist-painter turned entrepreneur. He presented his first business based on large, rollable, AC-electroluminescent displays for advertising and fashion. These custom displays have been replaced by programmable LCD and LED displays. Polyphotonix is exploiting a new OLED manufacturing technology to produce low-cost low-performance displays and lighting. R. Kirk was adamant that the OLED community needed to work together with the design community in order to discover applications where OLEDs could have an impact. He does not believe that OLEDs can prosper as a replacement for standard fluorescent lighting fixtures.

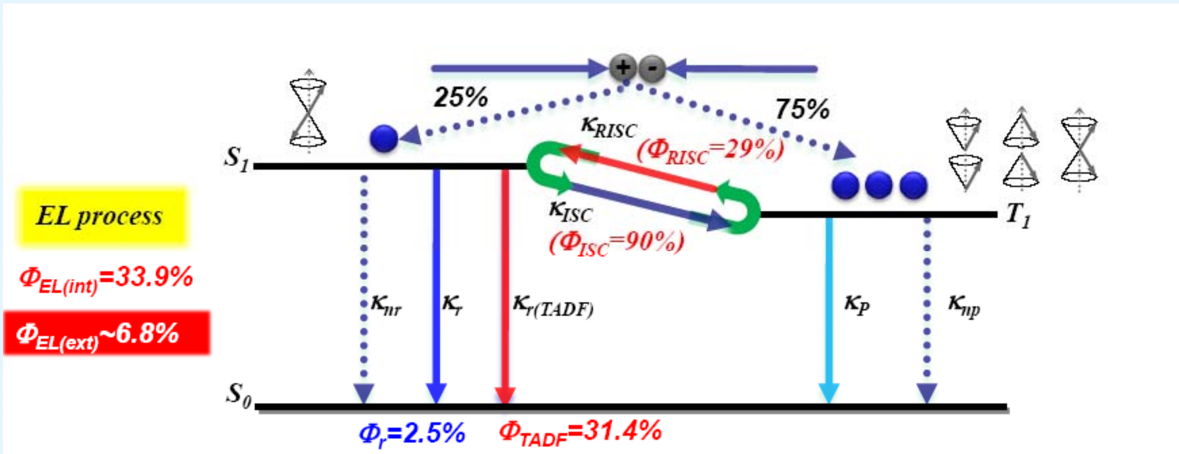
Goose Design and PDD joined forces again and created a concept for a new cycling jacket based on emerging technologies including printed electro-luminescent ink and printed photovoltaic technology, with red lighting at the back, and white at the front. The jacket was designed to be discreet once switched off for multi use and addressing the needs of the commuter lifestyle.

Edward Young, Holst Centre, Eindhoven

E. Young presented the technical unsolved challenges related to continuous processing on flexible substrates (roll-to-roll). High volume roll-to-roll manufacturing of OLEDs will significantly reduce their cost. Moisture penetration is a big problem. Low work-function metals like lithium and Mg readily oxidise in the presence of water vapour. A standard package design with glass seal and getter will not work: glass is not flexible. The Fast2Light project is focussing on a thin film, flexible package. Water penetration is mitigated by a multilayer SiN-polymer combination.

Chichiya Adachi, Kyushu University, Japan

C. Adachi talked about new ideas: Thermally-Activated Delay Fluorescence, Organic FETs, Liquid OLEDs and molecules with an anisotropic dipole to enhance emission perpendicular to device plane using orientation.



Prof. Adachi argued that you can recover some of the triplet excitation via the Reverse Intersystem Crossing (RISC) process. Of course this thermally activated excitation depends on the ambient temperature and the energy difference between the single and triplet states.

Intersystem crossing normally transfers singlet energy to triplet states reducing luminescence. However, this process can be run in reverse = RISC if the temperature is adequate, and the energy difference between the singlet and triplet states is not too large. (~0.1eV ≈ kT at room temperature) The energy difference can be reduced by choosing organics with a low overlap between HOMO and LUMO bands. Of course low overlap also means low luminescence, and there is a trade-off.

An OLED Glossary for the OLED and Lighting Communities

A collection of terms and definitions supports standards and takes the first step toward an OLED dictionary.

Before introducing standards a common use of terms and definitions is an important boundary condition. OLED100.eu has created a glossary on OLED lighting terms. This document reflects the need for a standardized language and a common understanding when it comes to an interdisciplinary communication about OLEDs.

Originating from displays, now emerging to higher demanding lighting applications, the technology attracts several groups of technical experts ranging from basic researchers to application engineers and lighting designers. The glossary is a first attempt on the road to standardized language.

The document is created and updated continuously. It will be made available to OLED players world-wide and their feedback will be used for improvement of this document. OLED and lighting experts from every discipline are invited to download the document from www.oled100.eu and feedback their comments back to the project

A further download opportunity on OLED perception case studies

Following the public deliverable on aesthetical perception case studies from September 2009, the project has now published a second report on psycho-physiological perception studies which is now available for download on the project website www.oled100.eu.

The report is looking into specific large area emitter characteristics. One important distinguisher from point and linear lighting systems is that OLEDs currently exhibit a Lambertian radiation profile which has an important impact to their use in various applications. Another important differentiator is that OLEDs are currently driven at rather low luminance levels in order to achieve a non-glaring illumination.

These two characteristics should qualify OLEDs for direct view applications (low luminance) and applications which are targeting diffuse illumination scenarios (Lambertian profile). Especially diffuse illumination scenarios are not very well investigated so far and the aim of the studies described in this report is to find out whether large area emitters are relevant when it comes to the planning of such applications.

A prominent case for an application which requires non-Lambertian emission is office lighting where special attention is paid to horizontal illuminance and non-glare environment. Since OLEDs are able to fulfil both requirements with rather low luminance levels, the office application was chosen for deeper investigation.

Several special lighting environments were built around a standard computer work place and in-depth studies and analyses were performed in order to identify influential parameters on the comfort and activity levels of human beings. A differentiation is made between conscious aspects and unconscious parameters of the autonomous nervous systems which are not controlled by the will of people.

The conscious aspects are covering a visual performance test on contrast sensitivity under different lighting conditions (recognition and fast reaction required) and two questionnaires asking for subjective rating on work load and light quality. The unconscious parameters are heart rate variability, eye blinking frequency and galvanic skin response, all of them indicators for mental and physical stress or comfort.

A first study deals with bright walls where direct view is unavoidable. A comparison is made between self-luminous surfaces representing OLEDs and reflecting surfaces representing the use of other light sources.

In a second study two different light intensity distributions were realized and compared. One scenario exhibited a classical glare-free approach and a second one a Lambertian emission profile from the ceiling.

Partners in the OLED100.eu consortium are: Bartenbach LichtLabor GmbH, European Photonics Industry Consortium (EPIC), Evonik Degussa GmbH, Fraunhofer Institute for Photonic Microsystems (IPMS), Microsharp Corporation Limited, Novaled AG, Océ Technologies B.V., OSRAM Opto Semiconductors GmbH, Philips Technologie GmbH, Business Center OLED Lighting, Philips Technologie GmbH Forschungslaboratorien, Physikalisch-Technische Bundesanstalt (PTB), Saint-Gobain Recherche S.A., Siemens AG, Technische Universität Dresden, Institut für Angewandte Photophysik, Universiteit Gent.