

MAP-fis Essay Proposal, 2013-2014

Supervisor

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Title

Organic Light Emitting Devices for specific lighting application

Area

Materials

Summary of Proposal

Solid-state lighting (SSL) technology is appearing on the lighting scene, driving significant demand for new applications and solutions. Nowadays, inorganic lighting is the main player but the new OLED (Organic Light Emitting Diode) technology aim at revolutionizing both displays and lighting. Advantages of OLEDs include the possibility to bend their structure and tailor their properties, including the colour of emitted light, by modifying their molecular structure. While there has recently been a dramatic expansion in the use of OLEDs for small displays, particularly in electronic gadgets, the direct impact on the cost of OLED lighting products is not yet evident. Some forecasts show that the OLED lighting market will kick-start in 2014, reaching more than 200 mln\$ in 2015 and will grow to \$1.7 billion by 2020.

OLEDs are already been targeted to specific applications like monochrome lighting, transparent displays and information panels to the automotive industry, architectural illumination, general white lighting for home and offices, etc. Key problems with OLEDs are the rapid degradation of the organic layers when submitted to ambient atmosphere, the generally complex architecture of the device itself, in order to achieve high luminance and efficiencies and light extraction losses. Major research in several fronts are needed to solve these problems, either by developing more stable organic materials, devising new and simpler device architectures without compromising the optical and electrical characteristics of the OLED, developing new atmospheric barriers and effective forms of applying those to the OLEDs, developing and applying new transparent electrodes, etc.

Expected outcomes of the essay will be:

1. Identification of the current scientific/technological obstacles to a large-scale implementation of OLED lighting;
2. Identification of possible solutions to specific problems, focussing in a specific lighting



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application;

3. Definition of a research plan to implement the solutions identified in (2).

References

-Alastair Buckley (2013) Organic light-emitting diodes (OLEDs) Materials, devices and applications. Philadelphia: Woodhead Publishing Limited

-Pereira, Luíz (2012) Organic Light-Emitting Diodes – The use of Rare-Earth and Transition Metals. Boca Raton: CRC Press