Optimization of processing and encapsulation conditions of white OLED devices for decorative lighting applications

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Abstract

Solid state lighting is one of the most attractive areas either for scientific and research groups in the industrial field. [1] Aside from the new and super-LEDs (Light Emitting Diodes) obtained from inorganic semiconductors a novel area of research has been growing towards a very useful technological solution for distinct and revolutionary applications: the OLEDs. These devices offer several advantages over conventional light emitters, namely low power consumption (for same bright compared to the conventional sources), high efficiency, large areas of display and the very attractive possibility of flexible devices (impossible for any other light emitting materials). [2]
However, there are still several scientific issues to be improved before these devices are suitable for market launching. The most relevant are lifetime, device architecture (simple as possible in order to be well reproduced), and optimization of the active layers, either with new materials or by improving the injection layers [3].

In this work, we address the optimization of performance of OLED devices for niche lighting applications considering assessment of the luminescent profile of the materials by a complete optical characterization so to efficiency design the device architecture. The focuses are general lighting with white-OLEDs and decorative lighting applications with coloured OLEDs. The optical properties of the materials processed into thin films (as used in device fabrication) will also be analysed, in order to collect data after the materials molecular conformation. Device fabrication and optimization of processing conditions via thermal evaporation is addressed and detail [4].
A complete optoelectronic characterization of each device using DC measurements, electroluminescence, thermal characterization of a matrix of devices and corresponding brightness assessment was performed in order to obtain the figures of merit and assess the electrical injection properties. Additionally, the development of manual encapsulation aiming at stable, durable devices suitable for market applications was explored, with the ensuring study on lifetime of the device [5].

References

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