Abstract

The need to replace the toxic, rare and expensive materials of producing solid state LED as light sources with the alternative carbon-based C materials led to the emergence of organic LED (OLED) technology. In recent years, emphasis has been placed on polymeric materials for light emission from soft material sources (PLED). The physical properties of the polymers have paved the way for a wealth of reports of experimental development and optimization of flexible devices with printed light emission and carrier treatment layers without, however, being totally exhausted by cost-cutting and small-scale vacuum techniques. In this study we investigate and characterize a series of polymeric (innovative and commercial) broadcasting materials, an extensive range of colors, Photoluminescence spectroscopy (PL) and Spectroscopic Ellipsometry (SE) techniques, trying to find a correlation between the collected data. By developing standard rigid PLED devices we were able to record the Electroluminescence (EL) spectra of each material revealing similarities and differences with the PL. We recorded the electrical characteristics and intrinsic quantum efficiency for each polymer. With the help of the SE we have determined the ideal thicknesses of the layers involved. Moving one step further, we investigated and replaced those films that were blocking the full transfer of PLED growth to large-scale printing techniques such as Slot Die. Using mainly the Slot Die technique we developed the first flexible fully-printed PLEDs that were characterized in the same way as standard ones. The results showed that it is possible to achieve the efficiency of the PLED standard devices as well as on flexible. A number of phenomena have been observed regarding the performance of flexible PLED depending the electrical load and temperature increase.

Key words: PLED, Organic Printed Electronics, Fluorescent Polymers, R2R processes, Slot Die Coating,