ELECTRICAL ANALYSIS OF POLYMER LUMINESCENT DEVICES HAVING IZO AS CATHODE

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Abstract: A detailed electrical study of PLED structures having aluminum as cathode and indium-zinc oxide (IZO) thin films as transparent anode (anode/MEH-PPV/cathode) is presented. From stationary J-V and impedance measurements, at different temperatures, we investigated bulk transport phenomena and interfacial electrical properties. Equivalent circuits and Random-Free Barrier Energy models were used as theoretical tools to analyze quantitatively the results. Comparisons between these device structures with similar using ITO were done.

The control of carrier injection from the electrodes is crucial for the good performance of organic light-emitting diodes (OLEDs). ITO is the transparent hole-injector electrode currently used in OLEDs, and despite its adequate electrical properties, the active organic layer must be protected from ITO against oxygen contamination. In this work, we present a study of electrical performance of an ordinary PLED structure having indium-zinc oxide (IZO) thin films as transparent anode and aluminum as cathode. We use as active layer thin films of poly[methoxy-ethylexyloxy-phenylenevinilene] (MEH-PPV) or polyfluorene (PF) derivatives. IZO (In_2O_3:ZnO, 90:10 wt%) films (160 nm) were deposited by r.f. magnetron sputtering at room temperature. For electrical investigation we used impedance spectroscopy (0.1 Hz to 1 MHz) to analyze simultaneously bulk and interfacial electrical properties, and measurements were carried out at different temperatures. Stationary J-V curves were obtained to add experimental information at low frequency limit. Equivalent circuits and Random-Free Barrier Energy models were used as theoretical tools to analyze quantitatively the results. Comparisons with similar OLEDs made with commercial indium-tin oxide anodes showed that IZO is an excellent alternative for applications at organic electronic devices.

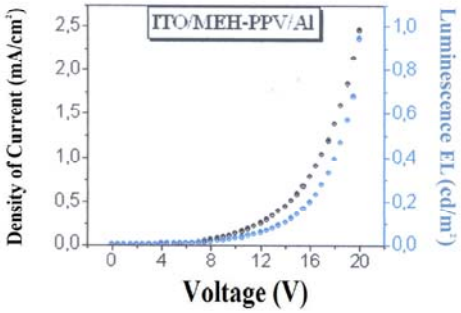

Fig. 1 – J-V and Luminescence curves of ITO/MEH-PPV/A1

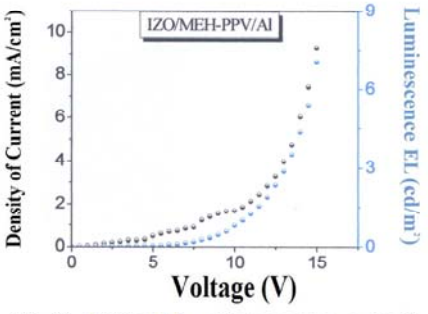

Fig. 2 – J-V and Luminescence curves of IZO/MEH-PPV/A1