

Effect of the UV-Ozone Exposure on Fluorescent OLEDs by Displacement Current Measurements and Morphology Measurements

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Organic light emitting diodes (OLEDs) have been a great interest of research recently. A number of modifications are carried out for the development of OLEDs. Charge accumulation at organic heterointerfaces studies using displacement current measurements (DCM) have been already demonstrated. Extending these studies to evaluate the effect of the UV-Ozone treatment on a hole-injection layer (HIL) of poly(3,4-ethylenedioxythiophene): poly(styrenesulfonate) (PEDOT:PSS) is demonstrated. A simple green emitting OLED structure was used with tris (8-quinolinolato) aluminum (Alq₃) as emitter. Two devices were fabricated to differentiate the effect of the exposure on the PEDOT:PSS. DCM measurements were followed by current-voltage-luminance measurements. PEDOT:PSS was spin casted on to two slides of SiO₂ and then controlled UV - O₃ exposure to measure the morphology changes. The study shows improved luminance levels up to ~25 cd/m² from the treated device. Interface charge was calculated under the 100 V/s sweep rate as -0.86 mA/m², where ~ 1.1 mA/m² of interface charge for the non-treated. Above results corresponds to the quasi static state of the device. Transient state of the device was analysed using sweep rate dependence in order to acquire data about contact resistance, which was not visible. AFM results suggested a reduction in the PEDOT:PSS layer, etched which must be resulted upon the exposure. The exposure is reported for work function tuning of the PEDOT:PSS and here it is revealed that exposure will reduce the interface charge at the interface, which leads to the improvement of efficiency.

Keywords: DCM, PEDOT:PSS, charge accumulation, interface charge