PROBING OF RECOMBINATION ZONE IN HIGH EFFICIENCY BLUE OLEDS FOR THEIR STABILITY ENHANCEMENT

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In the past few years materials using thermally activated delayed fluorescence have experienced enormous attention thus allowing organic light emitting diodes (OLED) to reach internal quantum efficiency of 100%[1]. However commercially viable devices must possess a high external quantum efficiency, which can be achieved by optimizing the OLED's architecture. Structural refinement is only achievable when the exciton distribution in emitting layer (EML) is known[2]. It has been shown that by inserting a small amount of emitter that emits in another part of the spectrum it is possible to map exciton location in EML[3].

The aim of the research was to show how exciton positions in EML depends on mixed host concentration. Using a well understood green **4CzIPN** emitter as pre, a portion of EML would be doped with it. By comparing the green shift of OLEDś spectrum peak to the position of the probe in a mixed host, the exciton distribution will be determined.

Vacuum-deposited devices had an EML consisting of a mixed host **mCBP-CN:mCBP** doped with 7% **DMeCzIPN** emitter and probed with 2% **4CzIPN**. The device structure (see Fig. 1) is based on the past work of the scientific group[4]. OLEDs exhibited EQE up to 19% and the highest brightness up to 130000 cd/m^2 at a current density of 2500 mA/cm^2. The obtained results (see Fig. 1) show that the spectrum peak characteristics depend on the probeś position. At OLED turn-on, all devices exhibited spectrum peaks around 502 nm wavelength, meaning that the recombination zone is uniformly distributed in the EML. By increasing the voltage, devices with a probe further from the HTL showed a smaller peak shift, indicating that the recombination zone shifted towards the ETL.

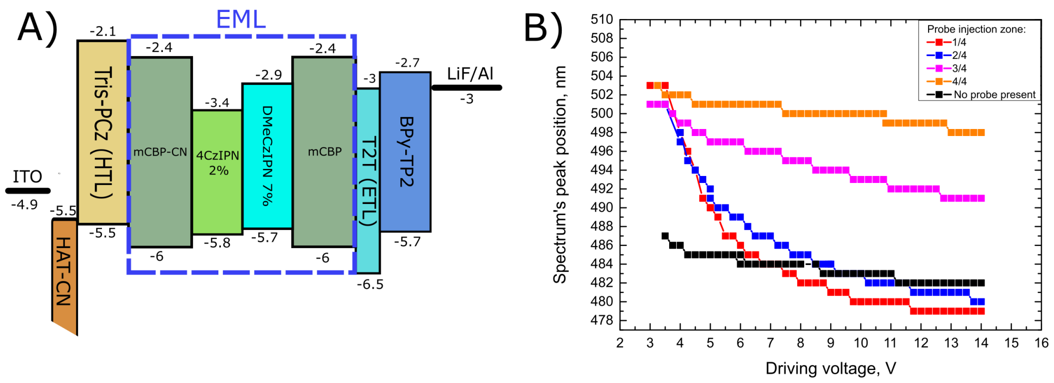

Fig. 1. A) Energy level diagram of mixed host OLED; B) Emision spectrum peak position vs driving voltage and it's dependency on probe position

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