MASTER'S THESIS

Multicolor organic light-emitting devices based on hydroxyquinoline complexes

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Abstract

Significant advances have occurred in the development of organic light emitting diodes (OLEDs) in past-few years. For applications on display technology, the highly efficient blue and red light emitters are still under search. In this thesis, we fabricated blue and red OLEDs by using new blue organic light emitters and by dye-doping method respectively.

A bright blue light emitting material, bis(2-methyl-8-quinolinato) aluminum(III) hydroxide complexes ($Almq_2OH$), was first introduced. $Almq_2OH$ was an efficient emitter and its OLEDs exhibited excellent electroluminescent ability. Its emission exhibited a peak at 485nm. The electrical and optical performance of $AlMq_2OH$ based OLEDs were studied in details and was compared to Alq_3 based OLEDs. We also studied in details the intra-molecular properties of $Almq_2OH$ by quantum chemistry analysis. Moreover, a series of bis(2-methyl-8-quinolinato) aluminum(III) complexes ($Almq_2OL$), were also reported. Their properties were studied and compared to the performance of the multi-layer OLEDs

Doping technique was applied on OLEDs for tuning the colour of OLEDs. The idea originated from the concept of Förster Energy Transfer- a host light emitting material donates energy non-radiatively to dopant molecules. Three laser dyes: DCM II, coumarin 540 and perylene, were doped in the light emitting layer by co-evaporation. The electrical and optical properties of the doped OLEDs were discussed. After doping, the OLEDs had colour change and luminance enhancement. The performance of the doped OLEDs was also optimized by modifying on device structure, by selecting suitable host material and by finding the optimum dopant concentration.

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