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The effect of nano-sized Alq3 on the external quantum and power efficiency of OLEDs

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Abstract content
   (Max 300 words)

Since its first report in 1987 by Tang and Van Slyke, tris-(8-hydroxy-quinoline) aluminium (Alq3) has been used in organic light emitting devices (OLEDs) both as a green light emitting material and as an electron transporting layer (ETL). OLEDs consist of an electroluminescent (EL) medium of thin layers (<0.2 μm) sandwiched between two electrodes. Some organic layers transport holes and others electrons. When a potential difference is applied between the anode and the cathode the holes and electrons will migrate towards the opposite charged electrode. Holes and electrons then transfer to the emitting material forming tightly bound excitons which emit photons upon relaxation. These photons are then capable of escaping from the device architecture through the transparent anode and out the glass substrate.

In this study, we have synthesized nano-sized Alq3 for use in fabricating OLEDs by thermal evaporation. The average particle size of Alq3 calculated, from the X-ray diffraction (XRD) data, using the Scherrer's equation was 40 ± 5 nm. In devices, Alq3 was used as both the ETL and emitting layer (EML), while commercial N,N'-di(naphthalen-1-yl)-N,N'-diphenyl-benzidine (NBP) was used as the hole transporting layer (HTL). Both layers were 50 nm thick. Indium tin oxide (ITO) coated onto a glass substrate was used as the anode, while the cathode consisted of Al:Cs2CO3. Devices fabricated using Alq3 prepared in this study were compared with those fabricated using commercial Alq3 from Luminescence Technology Corp. The electroluminescent spectra of the two devices show nearly identical behavior, confirming successful synthesis of the Alq3. Furthermore, the current-voltage-luminance characteristics were measured and the external quantum and power efficiencies of the two devices were compared. X-ray photoelectron spectroscopy (XPS) and a 10kV C60 ion gun was used to do depth profiles on the samples to confirm the layer thickness and composition at the layer's interfaces.

Apply to be
 consider for a student
   award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
   PhD)?

PhD

Main supervisor (name and email)
and his / her institution

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Would you like to
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Yes

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