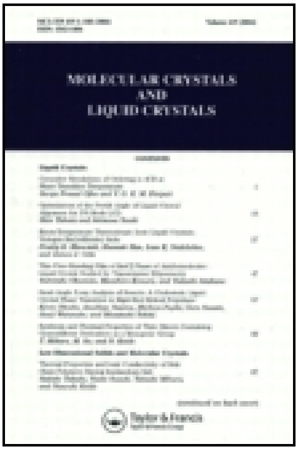

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Synthesis and Properties of Organic Light-Emitting Diodes Using New Emissive Materials

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Synthesis and Properties of Organic Light-Emitting Diodes Using New Emissive Materials

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We have synthesized the new blue electroluminescent material, Bis(3-N-ethylcarbazolyl)cyanoisophthalidene(BECCIP), and characterized its properties by UV/visible absorption, photoluminescent(PL) and electroluminecent(EL) spectrum. This material is well vacuum-deposited for thin film and has clear surfaced thin film property. The BECCIP shows blue PL and EL spectra at around λ_{max}=485nm.

Keywords: Organic light-emitting diodes; BECCIP

INTRODUCTION

Recently, Tamoto et al., reported several bipolar emitting molecules with both an oxadiazole as an electron transport unit and a triphenylamine group as a hole transport unit[1]. When these units were incorporated into the molecular structure of emitting materials, the device using these molecules as an emitting layer showed improved electroluminescent characteristics. We were already reported of the Bis(3-N-ethylcarbazolyl) cyano-terephthalidene(BECCP) as a blue emitting material[2, 3]. In this paper, we report electrical and optical properties of BECCIP when it is used as an emissive layer in organic light-emitting diodes.

EXPERIMENTALS

Figure 1 shows a synthesis process and molecular structure of BECCIP.

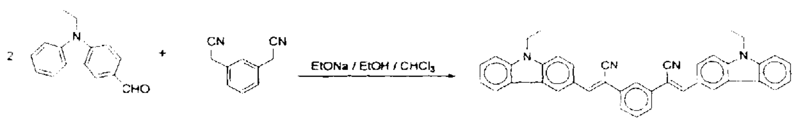

FIGURE 1. Synthesis of BECCIP.

UV/visible absorption, PL and EL spectrum were measured using a HP8452A spectrophotometer and Perkin Elmer luminescence spectrometer LS50. For EL device, the BECCIP were vacuum deposited on top of ITO-glass(Samsung Corning Co.) under 10^{-6}torr, the rate of deposition was 0.5Å per second, an emitting area was $15mm^2$ and aluminum layer was continuously deposited under the same vacuum condition.

RESULTS AND DISCUSSION

Figure 2a shows the UV/visible absorption and PL spectrum of the BECCIP film on quartz substrate. The UV/Visible absorption bands are at

300, 320, and 390nm and blue PL at λ_{max}=485nm. Figure 2b shows a comparison of the PL of the BECCP and BECCIP. The PL intensity of BECCIP is stronger than that of BECCP at the same film thickness, which indicates that the BECCIP is more appropriate candidate than BECCP for blue-emitting material.

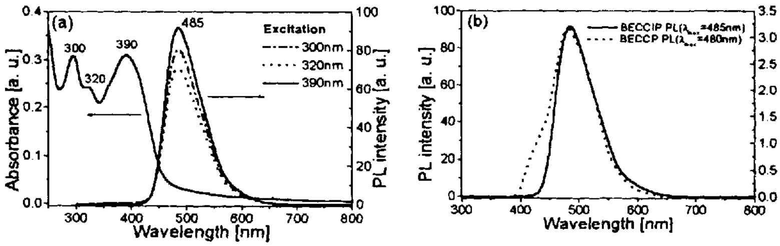

FIGURE 2. UV/visible absorption, PL spectrum (a) of the BECCIP and comparison of PL intensity (b) of the BECCP and BECCIP.

A conventional EL device was fabricated using vacuum(10^{-6} torr) deposited BECCIP emitting layer and Al electrode. ITO/BECCIP/Al device shows blue EL spectrum at λ_{max}=485nm and typical rectifying diode characteristics. Figure 3a shows a current density-voltage(*J-V*) characteristics in ITO/BECCIP(30, 60, 100nm)/Al devices. We observed that a turn-on voltage was decreased with a decrease of the film thickness. Figure 3b shows the EL spectrum in ITO/BECCIP(100nm)/Al structure when the operation voltage is around at 8V. It shows that there is a blue light emission with λ_{max} = 485nm, which is almost the same as PL of BECCIP.

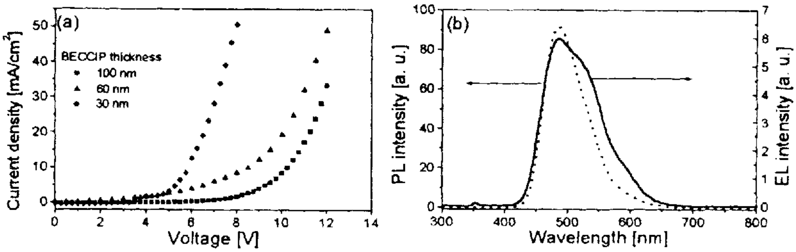

FIGURE 3. (a) Current density-voltage(J-V) characteristics, and (b) EL spectrum in ITO/BECCIP/Al device.

CONCLUSION

We synthesized the new blue material as a BECCIP, and observed PL and EL spectrum with λ_{max} at 485nm. Also, we compared the PL of the BECCP and BECCIP. The PL intensity of BECCIP is stronger than that of BECCP, which means that the BECCIP is better candidate than BECCP for blue-emitting material.

Acknowledgment

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