

# Silicon-based electron-transport materials with high thermal stability and triplet energy for efficient phosphorescent OLEDs

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A series of electron transporting materials was designed and used in organic light-emitting diodes (OLEDs), exhibiting green phosphorescence. We used the tetrahedral structural motif of silicon atom, which annulated with the 1,2-diphenyl-benzimidazole (DBI) units in its periphery (**1–4**) and their thermal, photophysical, and electrochemical properties were investigated. Photophysical and electrochemical properties showed that their LUMO levels can be slightly tuned with an increasing number of DBI units. Furthermore, thermal stability correlated well with an increase in the number of DBI units, showing a gradual increase in  $T_g$  values in the range of 100–141°C. The electron-only devices (EOD) based on compounds **2** and **3** were fabricated; EOD device with compound **3** showed higher current densities at the same voltages, indicating higher electron transport (ET) capability compared to compound **2**. The electron mobilities of compounds **2** and **3** were estimated as  $1.93 \times 10^{-5}$  cm<sup>2</sup>/Vs and  $3.67 \times 10^{-5}$  cm<sup>2</sup>/Vs at 1 MV/cm, respectively. We further investigated the excellent ET property of compound **3** via the phosphorescent OLEDs in which the electron-transporting material was coupled with the green emitter, Ir(ppy)<sub>3</sub> (Device I). Finally, we compared it with the device based on compound **2** (Device II). The OLED device with compound **3** exhibited maximum current and external quantum efficiencies of 62.8 cd/A and 18.0 %, respectively, with a small efficiency roll-off at high current densities. The devices I and II were fabricated with a structure of ITO (150 nm)/HATCN (10 nm)/TAPC (90 nm)/CBP:Ir(ppy)<sub>3</sub> 8% (20 nm)/**2** or **3** (60 nm)/Liq (1 nm)/Al (150 nm).

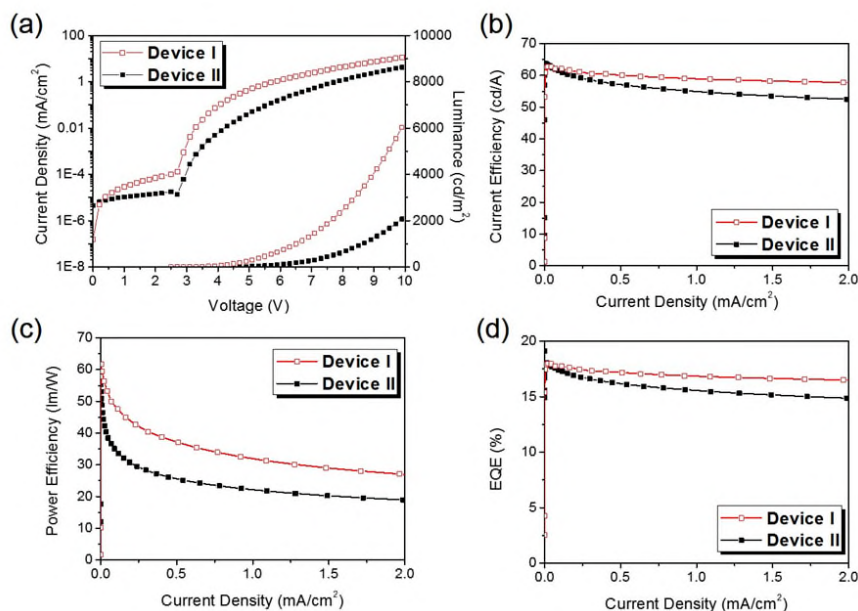


Fig. 1. EL performances of the devices with compounds **2** and **3** as ETMs

## References

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