Multi-color phosphorescent OLEDs with a non-conjugated bridge carbazole/thioxanthene-*S*,*S*-dioxide bipolar host

Young Pyo Jeon[1], Dae Hun Kim[1], Dong Chul Choo[1], In Kyu Moon[2], and Tae Whan Kim[1]
[1]Department of Electronics and Computer Engineering, Hanyang University, Seoul 133-791, Korea.
Tel.:82-2-2220-0534, E-mail: twk@hanyang.ac.kr
[2]Yonsei Institute of Convergence Technology, Yonsei University, Incheon 406-840 Korea

A novel bipolar host carbazole/thioxanthene-*S*,*S*-dioxide (EBCz-ThX) was simply synthesized by incorporating electron-donating carbazole and electron-accepting thioxanthene-S,S-dioxide into one molecule using the solventless green-reaction at 85°C. EBCz-ThX exhibited a high glass transition temperature of 227°C and a high triplet energy of 2.94 eV. The moderate highest occupied molecular orbital (HOMO) (-5.95 eV) and the lowest unoccupied molecular orbital (LUMO) (-2.63 eV) energy levels matching with the HOMO energy level of the hole transport layer and the LUMO energy level of the electron transport layer facilitated the transfer of holes and electrons into the emitting layer of organic light-emitting devices (OLEDs). Phosphorescent OLEDs (PHOLEDs) containing an EBCz-ThX host doped with blue, green, and orange dopants were fabricated. Figure 1 shows that the quantum efficiencies of the blue, green, and orange PHOLEDs were 10.8%, 7.4%, and 9.6%, respectively, indicating that EBCz-ThX bipolar host materials hold promise for potential applications in full-color and white OLEDs.

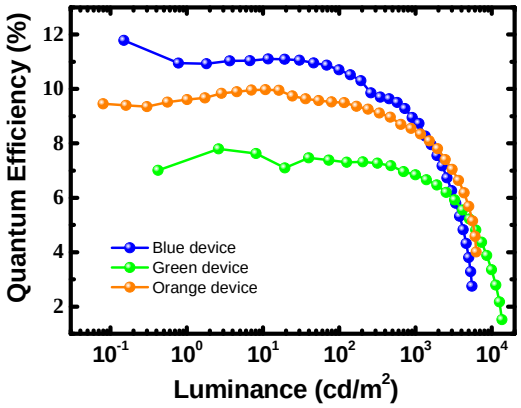

Fig. 1. Quantum efficiencies as functions of the luminance for red, green, and blue OLEDs with the same device structure.

Acknowledgment

This research was supported by Basic Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2013-016467).

References

1. C. W. Lee and J. Y. Lee, *Adv. Mater.*, 25(38), 596 (2013).
2. K. Udagawa, H. Sasabe, C. Cai, and J. Kido, *Adv. Mater.*, 26(29), 5062 (2014).
3. A. Wada, T. Yasuda, Q. S. Zhang, Y. S. Yang, I. Takasu, S. Enomoto, and C. Adachi, *J. Mater. Chem. C*, 1(13), 2404 (2013).
4. J. Xiao, X. K. Liu, X. X. Wang, C. J. Zheng, and F. Li, *Org. Electron.*, 15(11), 2763 (2014).