Supporting Information

Current density-voltage characteristics of exciplex-type organic light-emitting diodes expressed by a simple analytic equation

Takeshi Yasuda* and Kenji Sakamoto

Research Center for Macromolecules and Biomaterials, National Institute for Materials Science (NIMS), 1-2-1 Sengen, Tsukuba, Ibaraki 305-0047, Japan

*E-mail: YASUDA.Takeshi@nims.go.jp

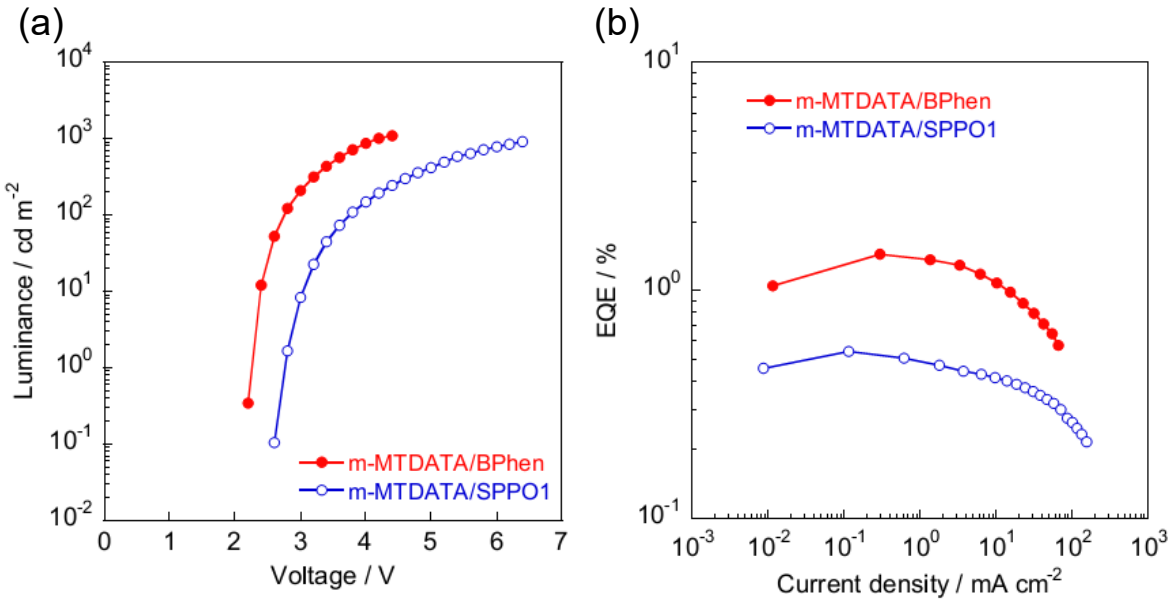

Figure S1. Characteristics of (a) luminance-voltage and (b) external quantum efficiency (EQE)-current density of the OLEDs fabricated in this study.

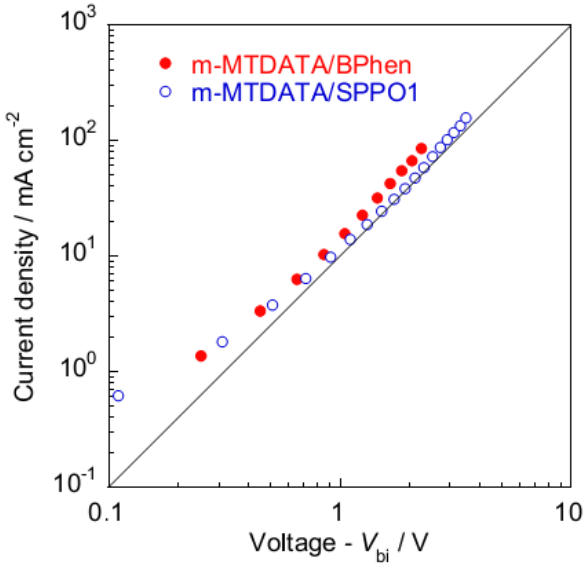

Figure S2. Modified *J*-*V* characteristics using the data from Fig. 3, demonstrating that J is proportional to the square of (V-V_{bi}): log $J \sim 2\log(V\text{-}V_{bi})$. The solid line represents a slope of 2 on the log-log plot.

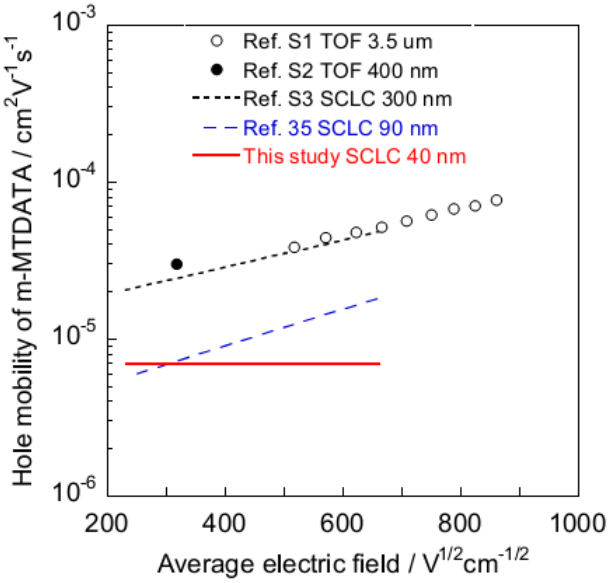

Figure S3. Hole mobilities (μ_h) for m-MTDATA thin films in this study and reported by other research groups. The measurement methods (TOF: time-of-flight) and the thickness of the thin films are also provided. The electric-field-dependent μ_h determined from SCLC are plotted in the electric field $E^{1/2}$ from 230 to 660 ($V^{1/2}cm^{-1/2}$) according to the following equation: $\mu_h = \mu_0 \exp(\beta E^{1/2})$.

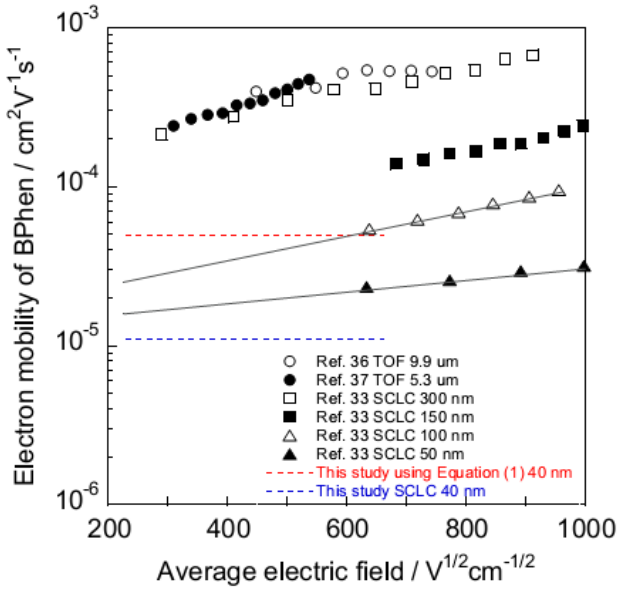

Figure S4. Electron mobilities (μ_e) for BPhen thin films in this study and reported by other research groups. The measurement methods and the thickness of the thin films are also provided. The solid line represents the electric-field-dependent μ_e for film thicknesses of 100 nm or less measured by Xu et al., extended to low electric fields according to the following equation: $\mu_e = \mu_0 \exp(\beta E^{1/2})$. In contrast, the dotted line depicts electric-field-independent μ_e estimated in this study.

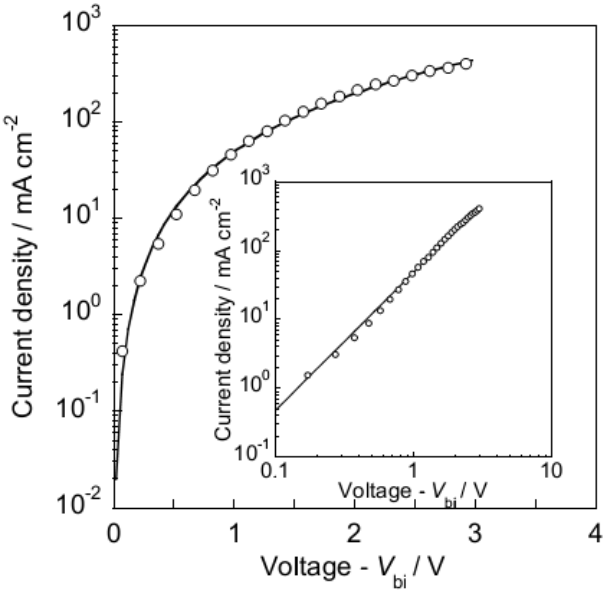

Figure S5. *J-V* characteristics for the electron-only device (ITO/BPhen (40 nm)/ LiF (1 nm)/Al). Electrons were injected from the LiF/Al side. The inset shows log-log plots of *J-V* characteristics. The solid curves are the best fit results using Equation (3).

References

S1) S. W. Tsang, S. K. So, and J. B. Xu, J. Appl. Phys. **99**, 013706 (2006).

S2) C. Giebeler, H. Antoniadis, D. D. C. Bradley, and Y. Shirota, Appl. Phys. Lett. **72**, 2448 (1998).

S3) G. Chauhan, R. Srivastava, A. Kumar, O. Rana, P .C. Srivastava, and M. N. Kamalasanan, Org. Electron. **13**, 394 (2012).