

Supporting Information

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Effects of Energy-Level Alignment on Operating Voltages of Blue Organic Light-Emitting Diodes

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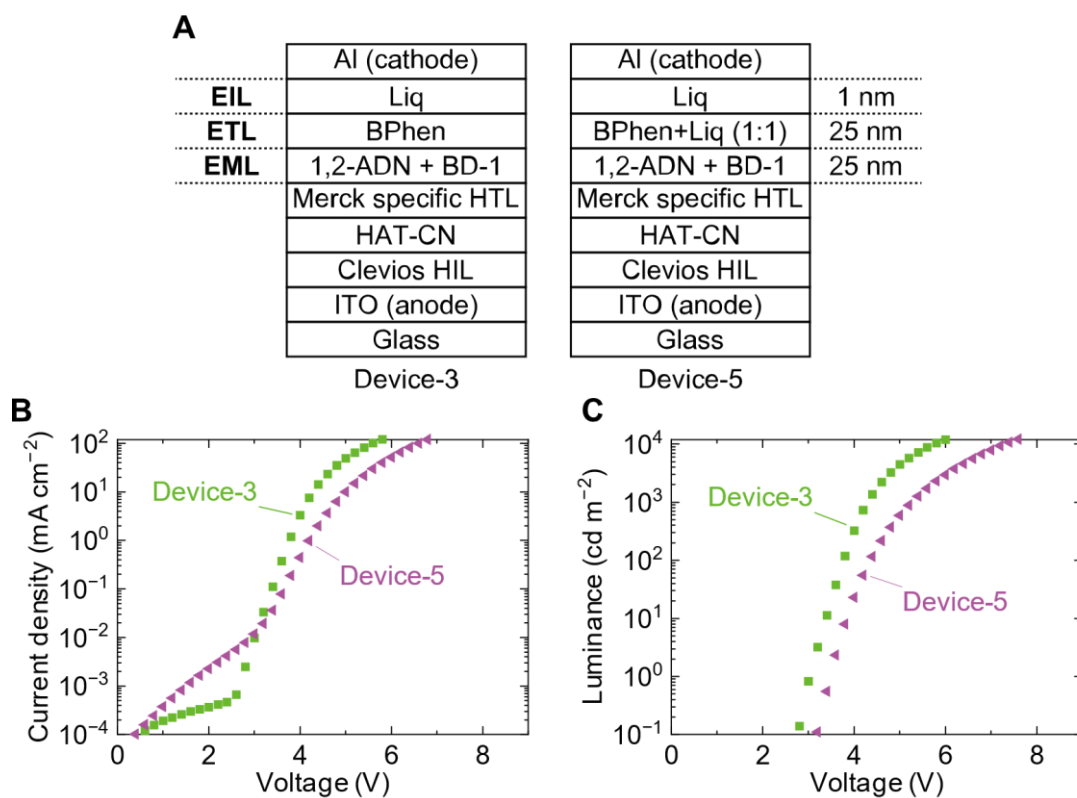


Figure S1. A) Multilayer structure of blue OLEDs employing BPhen and Liq-doped Bphen (50 wt%) as the ETL, and employing Liq as the EIL. B) Current density–voltage characteristics of blue OLEDs. C) Luminance–voltage characteristics of blue OLEDs.

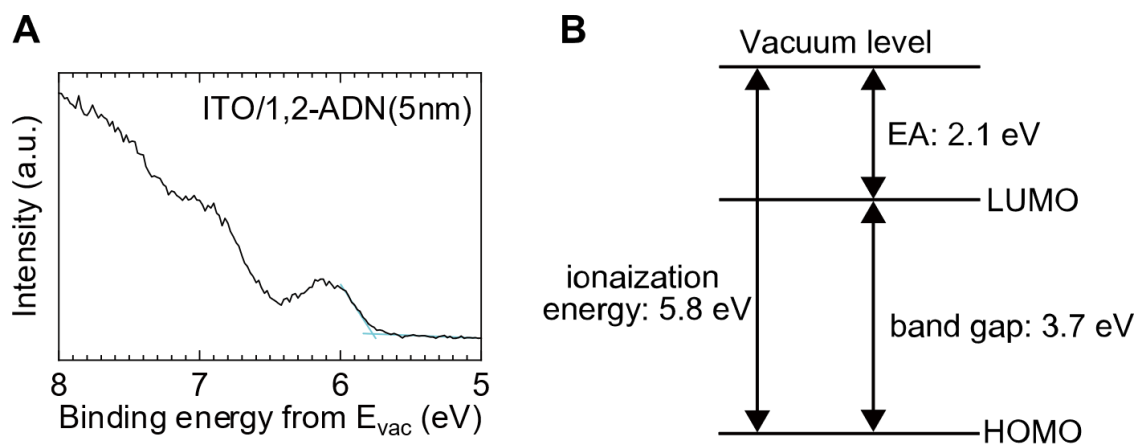


Figure S2. A) HeI UPS spectra of 1,2-ADN film on ITO in highest occupied molecular orbital (HOMO) regions. B) Summary of energy diagrams of 1,2-ADN film estimated from LEIPS and UPS spectra, where LUMO represent lowest unoccupied molecular orbital.

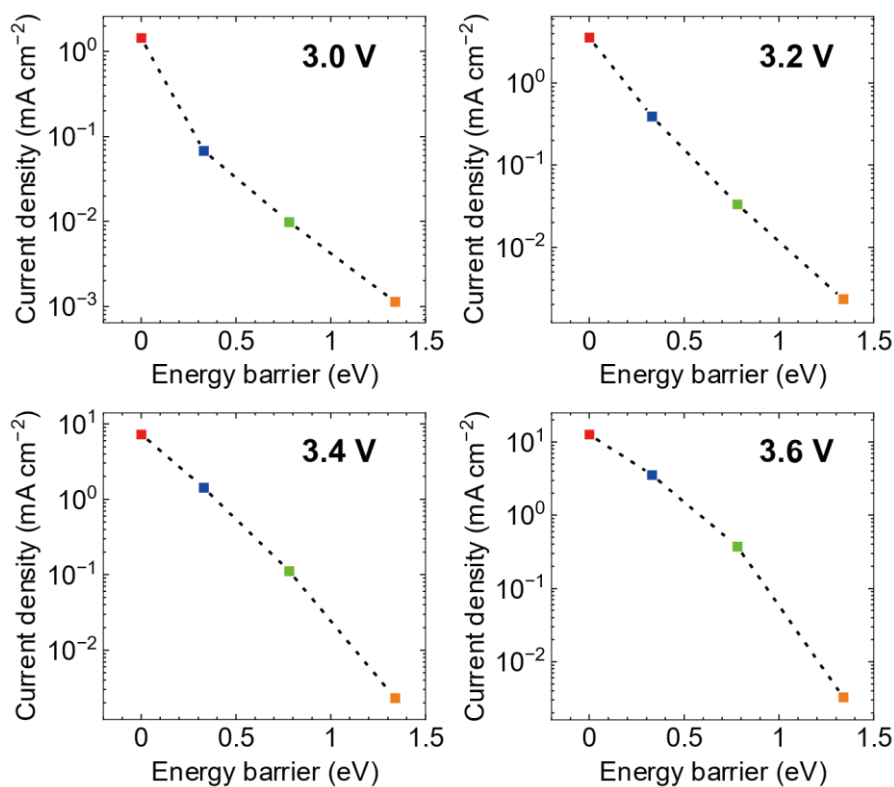


Figure S3. Correlation between the current density at an applied voltage from 3.0 to 3.6 V and the energy barrier between the cathode and the emitting layer for the four OLEDs.

Table S1. Summary of each blue OLED characteristics.

OLED	Voltage at current density of 0.1 mA cm^{-2} [V]	Voltage at current density of 1 mA cm^{-2} [V]	Current density at luminance of 1 cd m^{-2} [mA cm ⁻²]	Voltage at luminance of 1 cd m^{-2} [V]	Voltage at luminance of 100 cd m^{-2} [V]	Max current efficiency [cd A ⁻¹]	Max external quantum efficiency (EQE) [%]	LT50 ^{a)} from $5,000 \text{ cd m}^{-2}$ [h]
Device-1	2.7	2.9	1.7×10^{-2}	2.7	3.0	11.0	9.3	646
Device-2	3.0	3.3	1.4×10^{-2}	2.8	3.3	11.5	9.5	1325
Device-3	3.4	3.8	1.2×10^{-2}	3.0	3.8	10.1	8.5	15
Device-4	6.1	8.2	3.3×10^{-1}	7.2	- (high voltage)	1.3	1.1	- (short time)

^{a)}The LT50 is the time for the luminance to decay by 50% from $5,000 \text{ cd m}^{-2}$.