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Supporting Information

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

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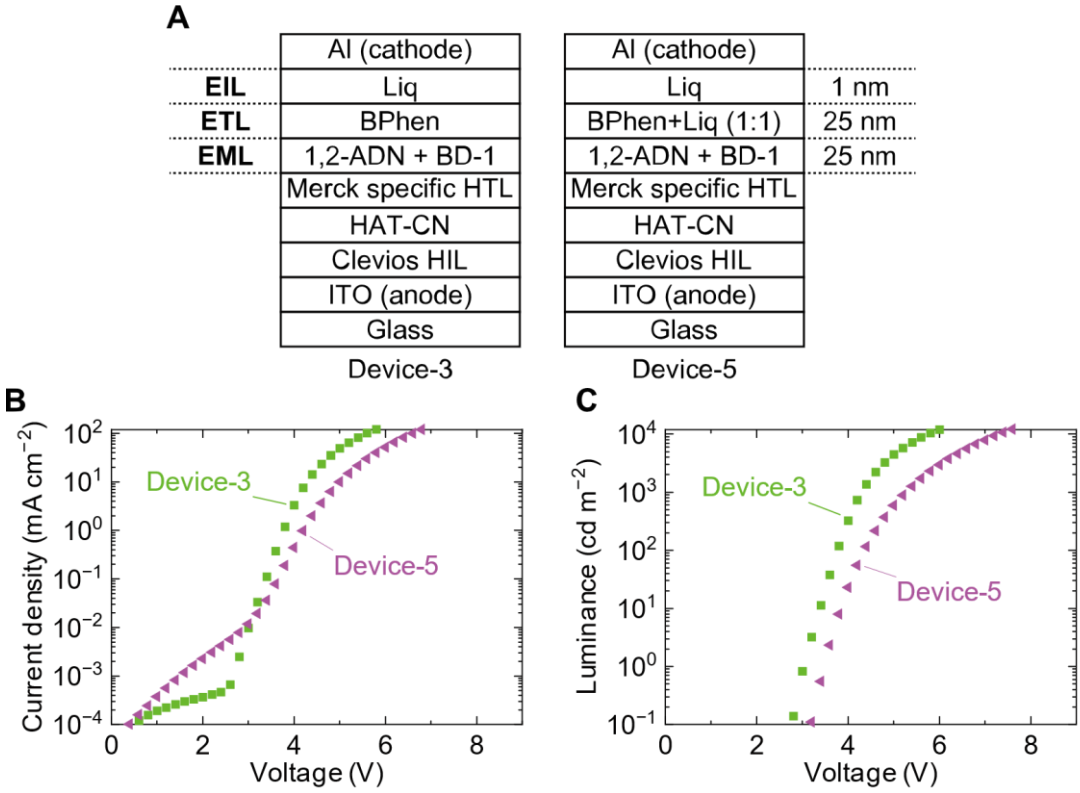

Figure S1. A) Multilayer structure of blue OLEDs employing BPhen and Liq-doped Bphen (50 wt%) as the ETL, and employing Liq as the EIL. B) Current density–voltage characteristics of blue OLEDs. C)Luminance–voltage characteristics of blue OLEDs.

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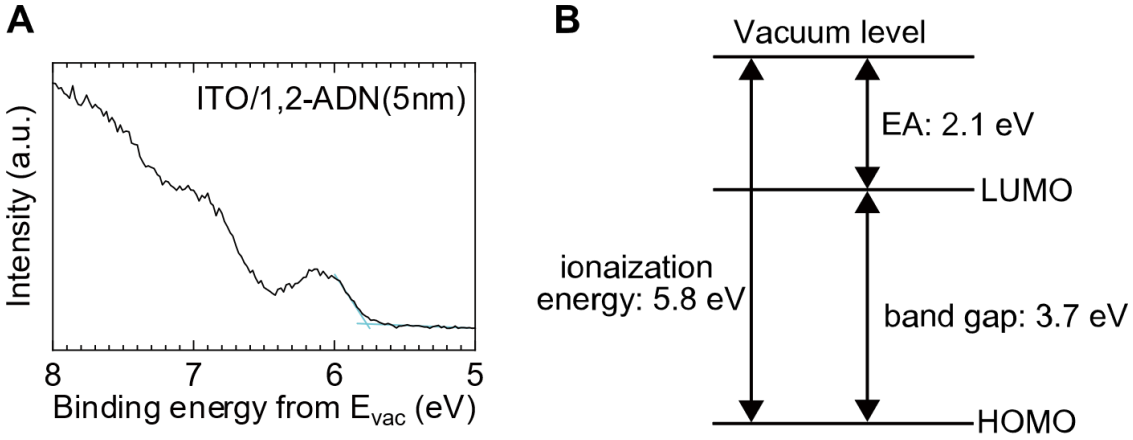

Figure S2. A) HeI UPS spectra of 1,2-ADN film on ITO in highest occupied molecular orbital (HOMO) regions. B) Summary of energy diagrams of 1,2-ADN film estimated from LEIPS and UPS spectra, where LUMO represent lowest unoccupied molecular orbital.

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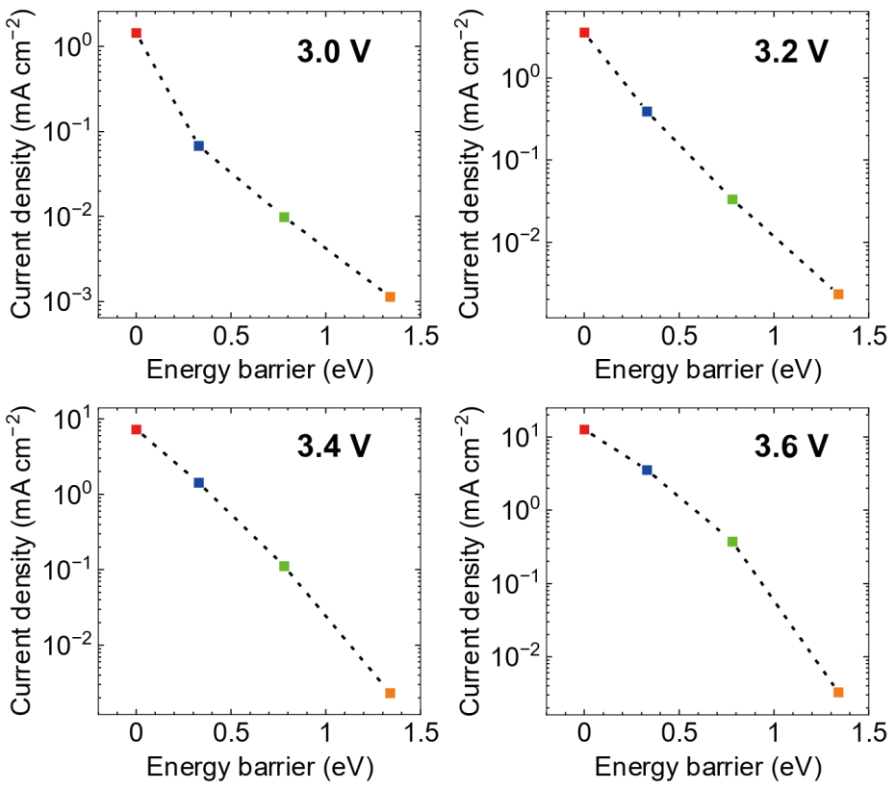

Figure S3. Correlation between the current density at an applied voltage from 3.0 to 3.6 V and the energy barrier between the cathode and the emitting layer for the four OLEDs.

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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 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 cd m^{-2}.

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