Electronic Supporting Information

Combined Optimization of Emission layer Morphology and Hole-Transport Layer for Enhanced Performance of Perovskite Light-Emitting Diodes

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Fig. S1 (a) Current density and luminance vs voltage (J–L–V), (b) current efficiency vs current density (CE–J), (c) external quantum efficiency vs current density (EQE–J) characteristics, and (d) normalized EL spectra (10 mA cm$^{-2}$) of the PeLEDs with blend films of PVK: MAPbBr$_3$ [x:20, (x= 0, 1, 2, 3)] as the emission layer.
Fig. S2 (a) Current density and luminance vs voltage (J–L–V), (b) current efficiency vs current density (CE–J), (c) external quantum efficiency vs current density (EQE–J) characteristics, and (d) normalized EL spectra of the PeLEDs based on crystal modification with blend films of PVK: MAPbBr$_3$ (w/w, 2:20) as the emission layer.
Fig. S3 CIE coordinates for the EL spectrum under a current density of 10 mA cm$^{-2}$, together with the photograph of the working device as an insert.

Fig. S4 EL spectra of the device-I under different current densities.
Fig. S5 Effect of the HTLs on the current density vs voltage (J–V) characteristics for the PeLEDs with PVK: MAPbBr$_3$ (w/w, 2:20) after crystal modification (MABr+TPBI) as the emission layer.

Fig. S6 Schematic illustration of crystal modification process for manufacturing perovskite thin films. (A) Dropped the PVK:MAPbBr$_3$ (w/w, 2:20) precursor solution on the surface of PEDOT:PSS or HTLs, then spin-coated with a certain revolving speed for 60 s; (B) After 6 s during the spin-coating, 30 μL crystal growth modifier was dropped to the film; (C) Then a ~30 nm thin blend film of emitters was got without annealing.