Supplementary Information

Regulating the Phase Distribution of Quasi-2D Perovskites using a Three-Dimensional Cyclic Molecule toward Improved Light-Emitting Performance

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Keywords: Quasi-2D perovskite; light-emitting diodes; cyclic molecules; phase regulation; additive engineering

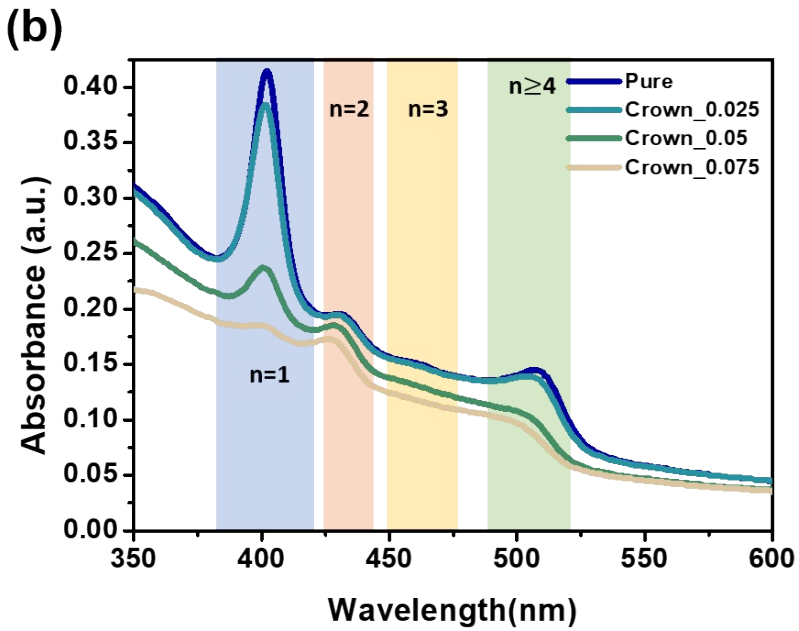

Figure S1. UV-vis absorption spectra of the quasi-2D perovskite films added with different doping ratios of Crown.

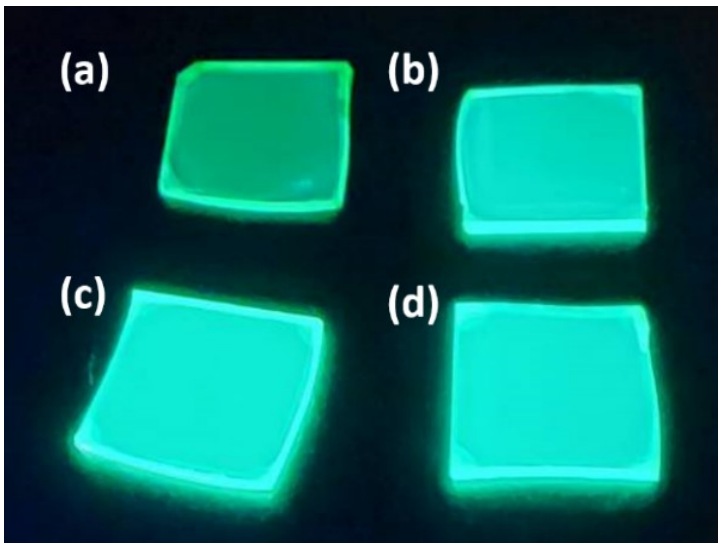

Figure S2. The films of (a) pristine quasi-2D perovskite and quasi-2D perovskite with (b) 0.025, (c) 0.05, and (d) 0.075 Cryptand (molar ratio relative to $PbBr_2$) under the excitation of an UV lamp.

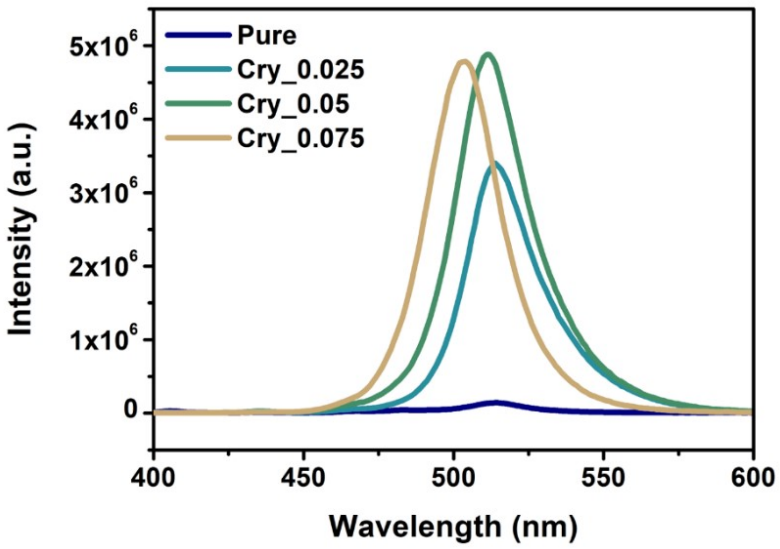

Figure S3. The originally unnormalized PL emission spectra of the quasi-2D perovskite films with different Cryptand doping ratios.

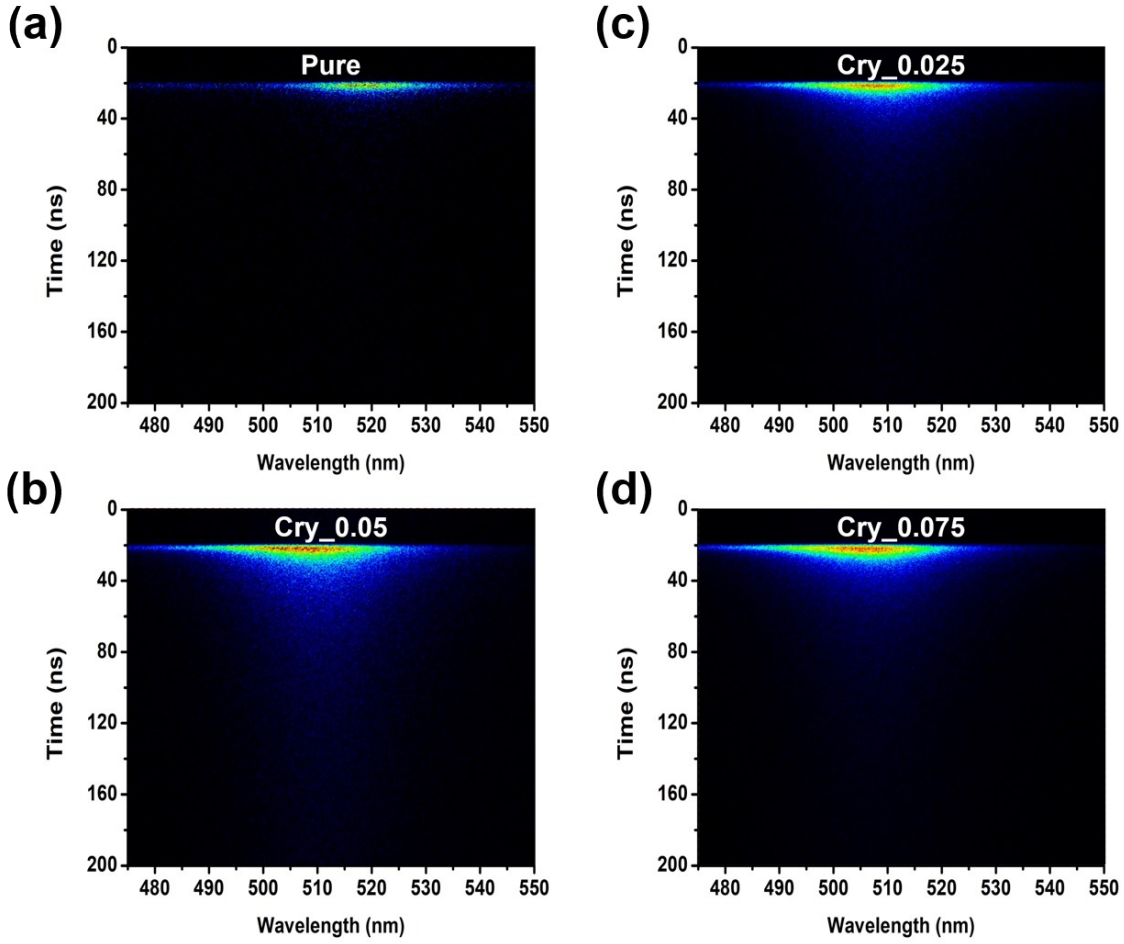

Figure S4. Time-resolved photoluminescence spectra (TRPL) for (a) the quasi-2D perovskite film and the films with (b) 0.025, (c) 0.05, and (d) 0.075 doping ratios of Cryptand.

Table S1. Fitting parameters of the TRPL results for the studied quasi-2D perovskite films.

Material	τ_1 (ns)	A_1	τ_2 (ns)	A_2	τ_{ave} (ns)
Pure	2.25	0.89	9.92	0.12	5.2
Cry_0.025	3.39	0.82	21.20	0.2	14.3
Cry_0.05	3.57	0.75	25.77	0.26	19.5
Cry_0.075	3.93	0.87	25.77	0.18	16.8

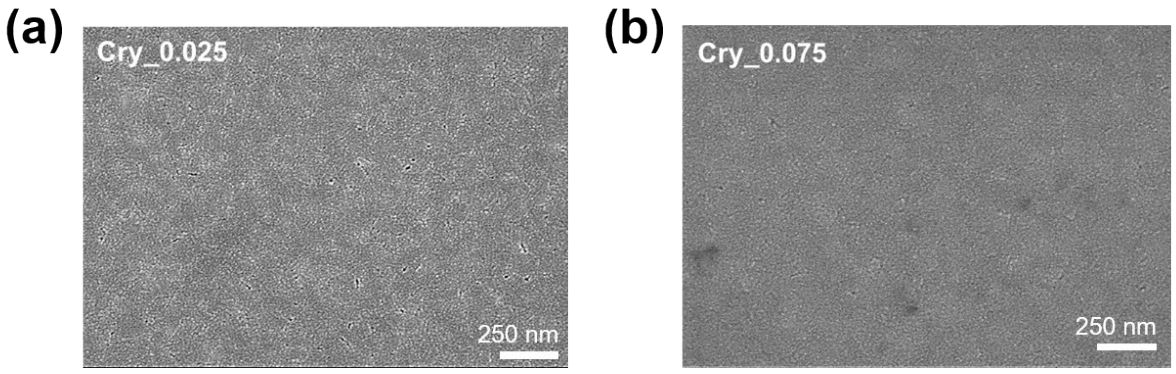

Figure S5. The SEM images of the quasi-2D perovskite films with (a) 0.025 and (b) 0.075 doping ratios of Cryptand.

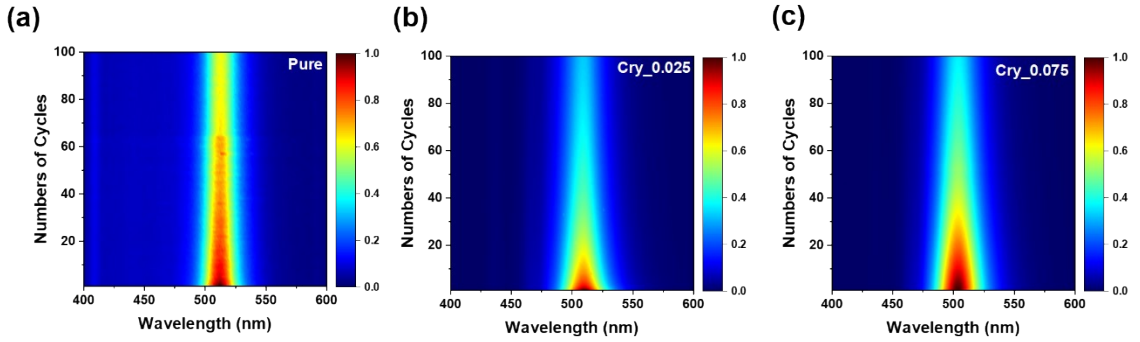

Figure S6. The contour plots of the PL stability test for (a) the quasi-2D perovskite film and the films with (b) 0.025 and (c) 0.075 doping ratios of Cryptand.

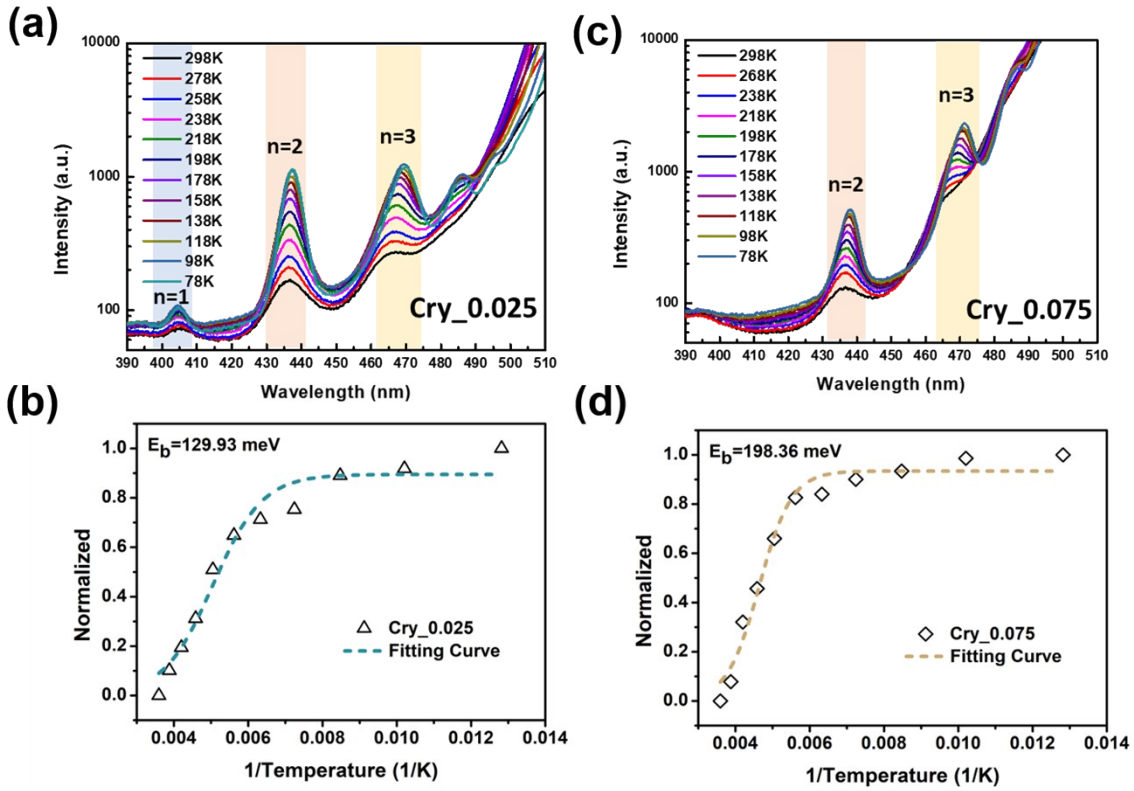

Figure S7. (a, c) Temperature-dependent PL spectra and (b, d) the calculated binding energy for the quasi-2D perovskite films with (a, b) 0.025 and (c, d) 0.075 doping ratios of Cryptand.

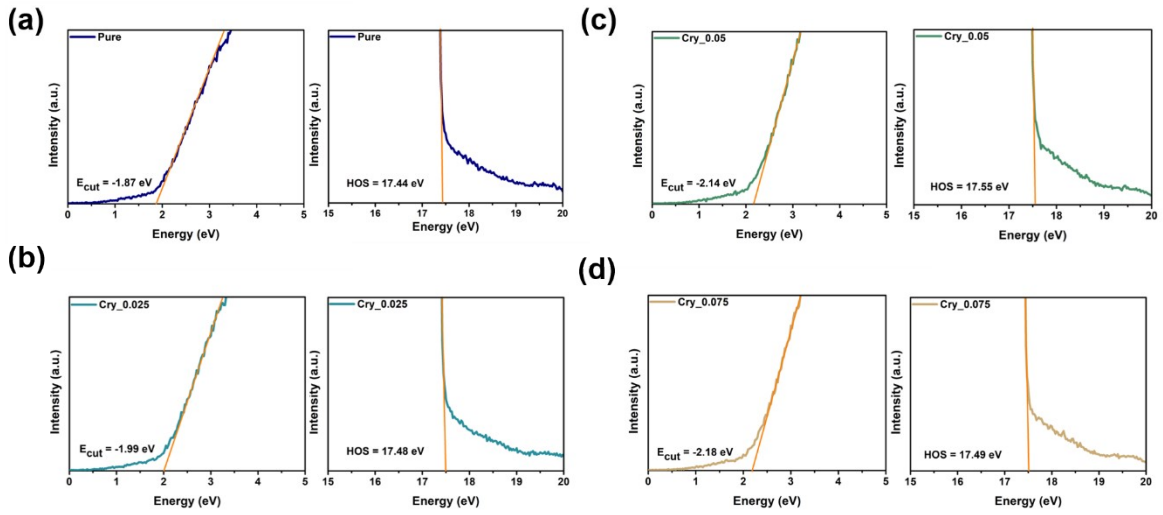

Figure S8. Ultraviolet photoelectron spectroscopy (UPS) spectra for (a) the quasi-2D perovskite film and the films with (b) 0.025, (c) 0.05, and (d) 0.075 doping ratios of Cryptand.

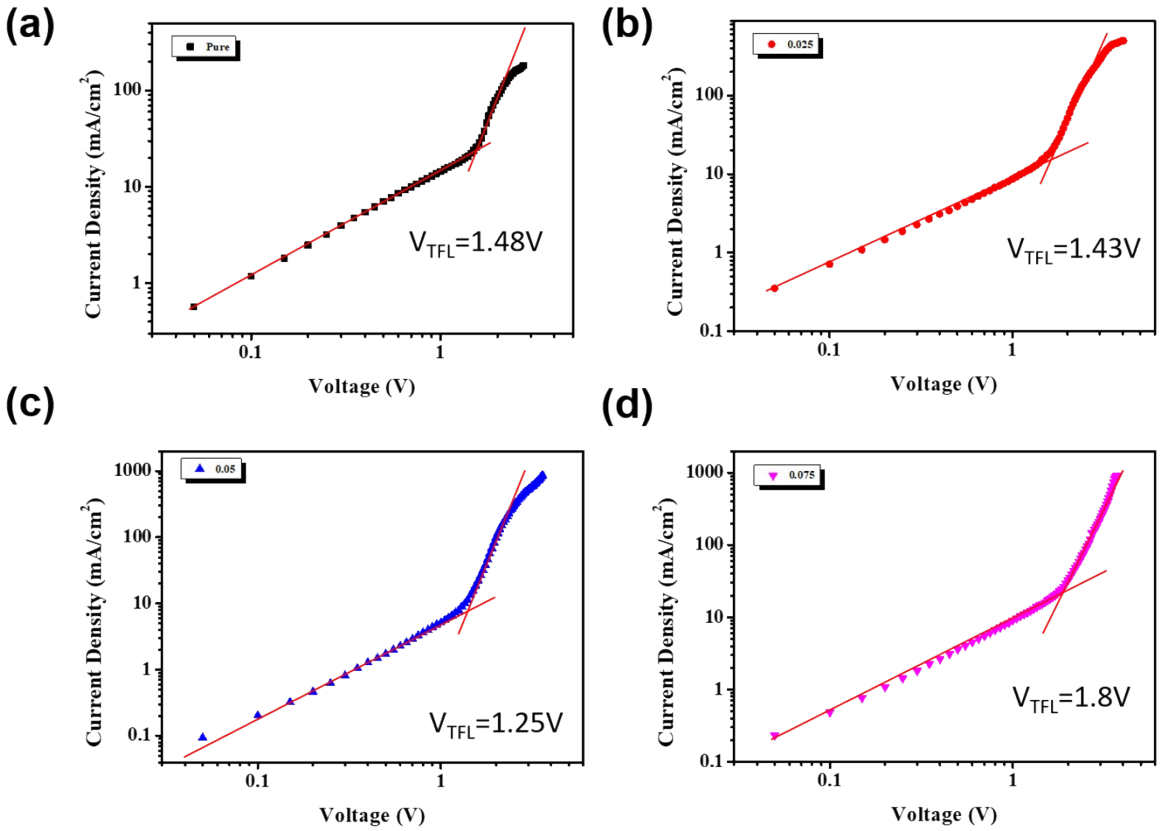

Figure S9. The calculated trap-filled limiting voltages (V_{TFL}) from the space charged limited current (SCLC) measurement of the hole-only devices based on (a) the pristine quasi-2D perovskite film and the films with (b) 0.025, (c) 0.05 and (d) 0.075 doping ratios of Cryptand.

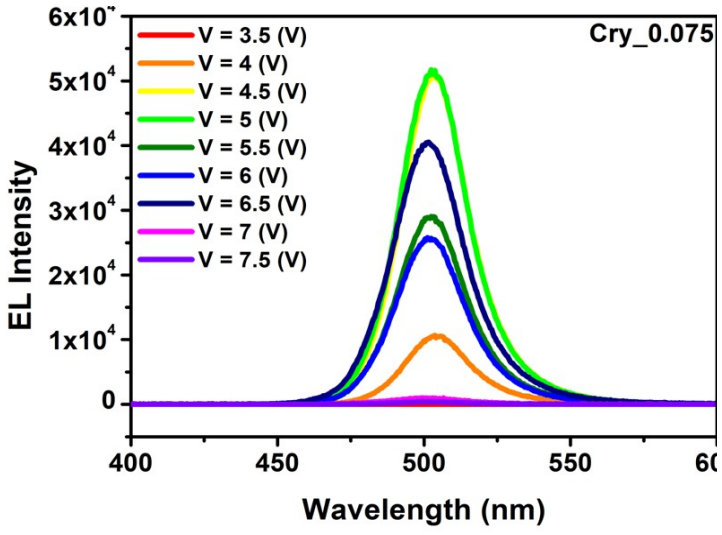

Figure S10. The EL curves of the device recorded under different biases based on the film with

0.075 doping ratio of Cryptand.

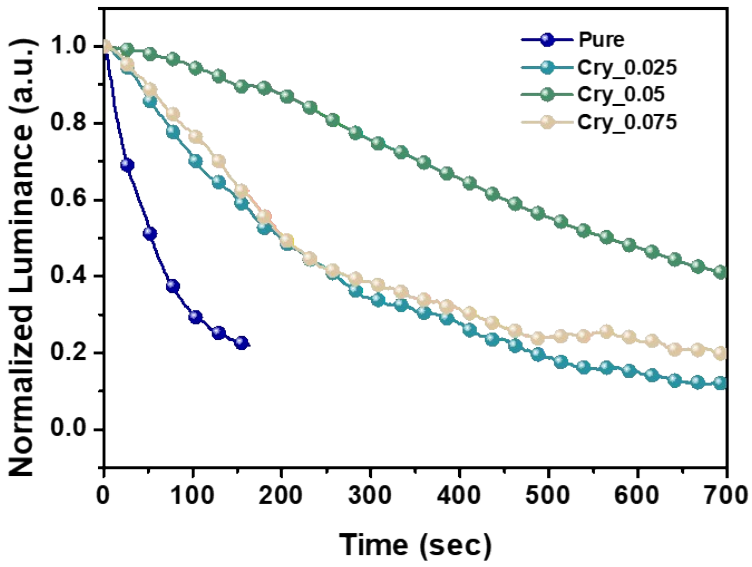

Figure S11. Operational stability of the fabricated PeLEDs based on the pristine quasi-2D perovskite film and the films with 0.025, 0.05 and 0.075 doping ratios of Cryptand.