

Supporting Information

84% efficiency improvement in all-inorganic perovskite light-emitting diodes assisted by a phosphorescent material

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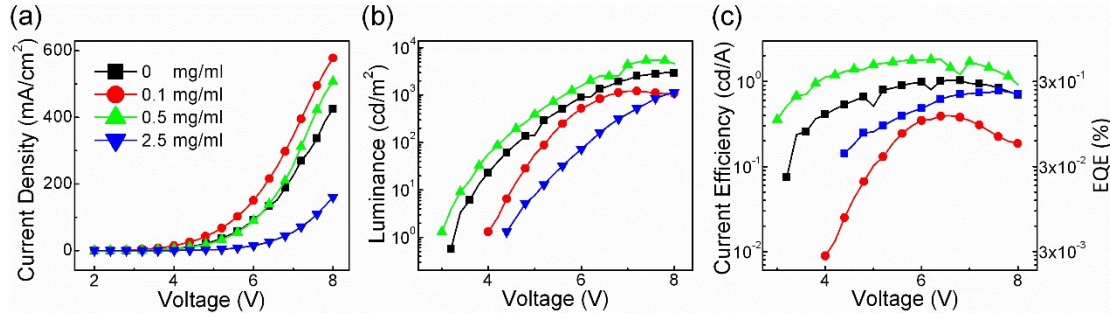


Figure S1. EL performances of devices with different concentrations of FIRpic: (a) current density-voltage (J - V); (b) luminance-voltage (L - V); (c) current efficiency-voltage-EQE (CE - V - EQE) of four PeLEDs with structured as: ITO (120 nm)/PEDOT:PSS (30 nm)/CsPbBr₃:FIRpic (X mg/ml)/TPBi (65 nm)/LiQ (2.5 nm)/ Al (120 nm), where “ X ” stands for 0, 0.1, 0.5, 2.5.

Table S1. Summary of performances for 5 PeLEDs in a single batch with composite emitter layer CsPbBr₃:FIRpic (0.5 mg/ml).

Device No.	$V_{(\text{turn-on})}$ (V)	L_{max} (cd/m ²) ^b	CE_{max} (cd/A) ^c	EQE_{max} (%) ^d
1	3.0	5486	1.80	0.47
2	2.8	5214	1.64	0.43
3	2.8	6470	1.68	0.44
4	3.3	4510	1.87	0.49
5	3.0	3093	1.54	0.40

^a Turn-on voltage at 1 cd/m².

^b Maximum luminance.

^c Maximum current efficiency.

^d Maximum external quantum efficiency.

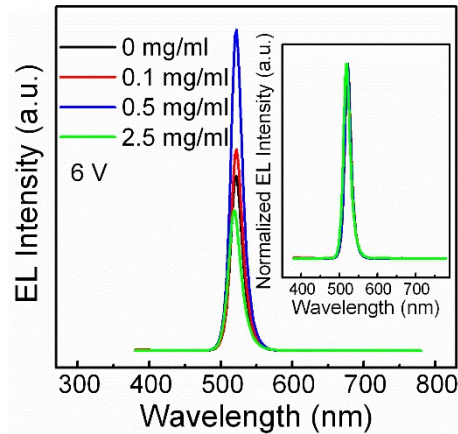


Figure S2. EL spectra and the Normalized EL spectra of the PeLEDs with different concentrations of FIrpc under the driving voltages of 6 V. The four PeLEDs are structured as: ITO (120 nm)/PEDOT:PSS (30 nm)/CsPbBr₃:FIrpc (X mg/ml)/TPBi (65 nm)/Liq (2.5 nm)/ Al (120 nm), where “X” stands for 0, 0.1, 0.5, 2.5.

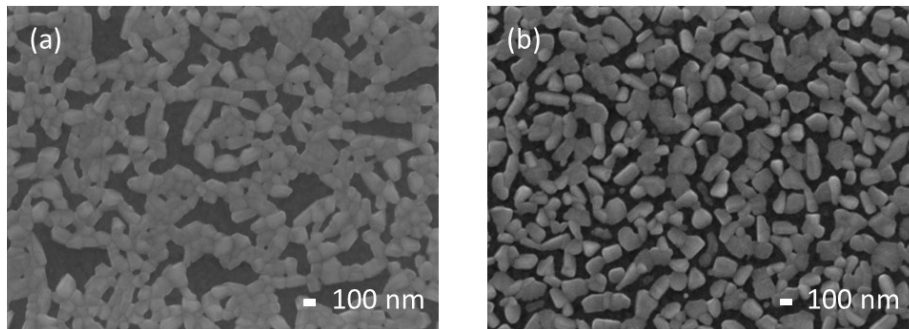


Figure S3. Top-view SEM images of perovskite films of (a) pristine CsPbBr₃, (b) CsPbBr₃ with FIrpc (0.5 mg/ml). It can be found, higher coverage is achieved in the perovskite film with suitable concentration of FIrpc (0.5 mg/ml) added in the CsPbBr₃ (77.7%, estimated from SEM images by using ImageJ software) than the one without FIrpc (76.1%), which benefit to the EL efficiency of PeLEDs.

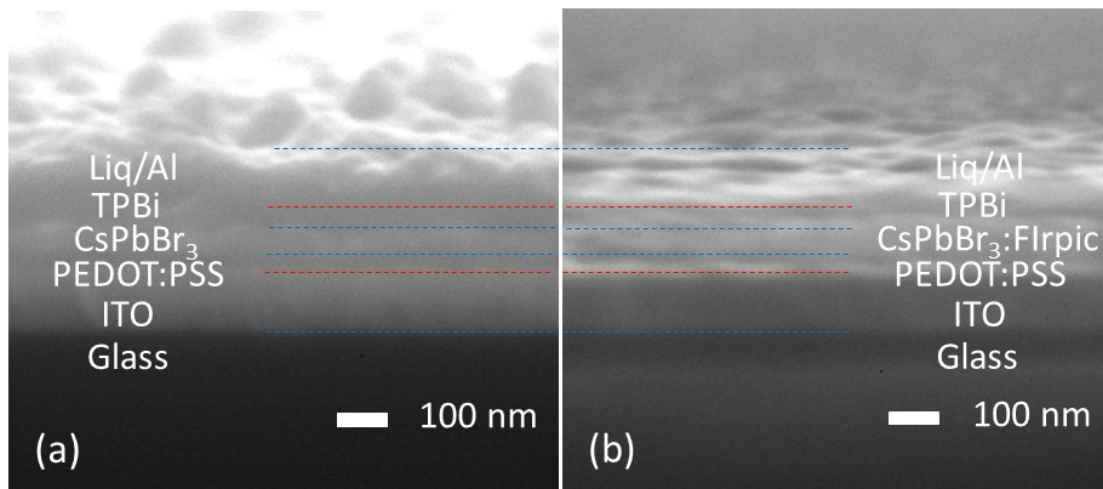


Figure S4. The cross-sectional SEM images of neat CsPbBr₃ and CsPbBr₃:Flrpic (0.5 mg/ml) based PeLED. The thickness of both the neat CsPbBr₃ film and CsPbBr₃:Flrpic film (0.5 mg/ml) are estimated to ~30 nm.