Electronic Supplementary Material (ESI) for Nanoscale.


**Supporting Information**

# Effect of the Solvent Used for Fabrication of Perovskite Films by Solvent Dropping on Performance of Perovskite Light-Emitting Diodes

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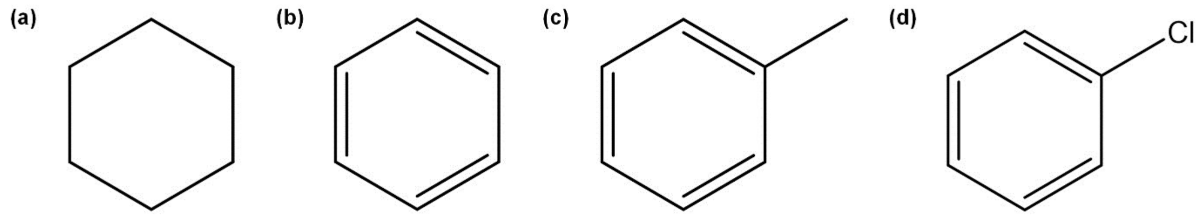


**Figure S1.** Chemical structures of (a) cyclohexane, (b) benzene, (c) toluene and (d) ch lorobenzene.

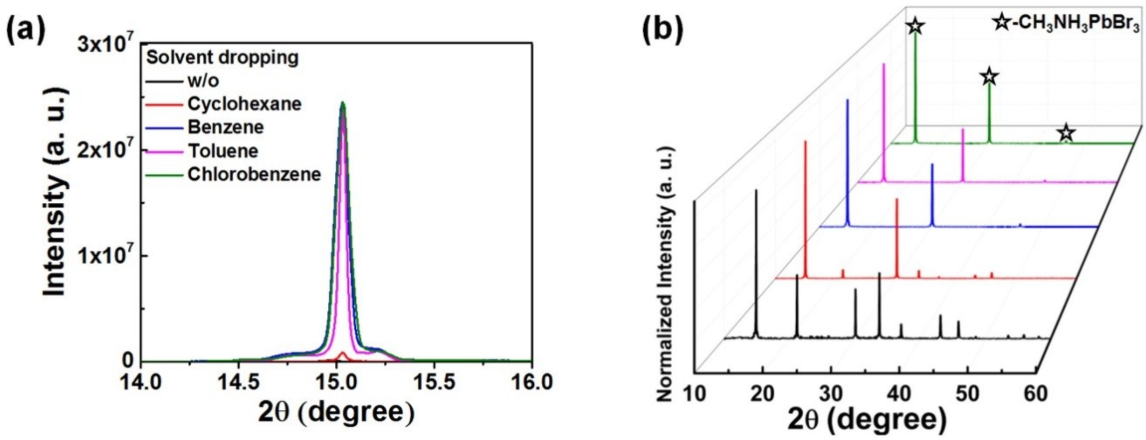


**Figure S2.** XRD patterns of $CH_3NH_3PbBr_3$ films prepared using various solvents with PMMA as the encapsulation layer and calculated for $CH_3NH_3PbBr_3$, with preferred ori entations along the (100), (200) and (300) directions.

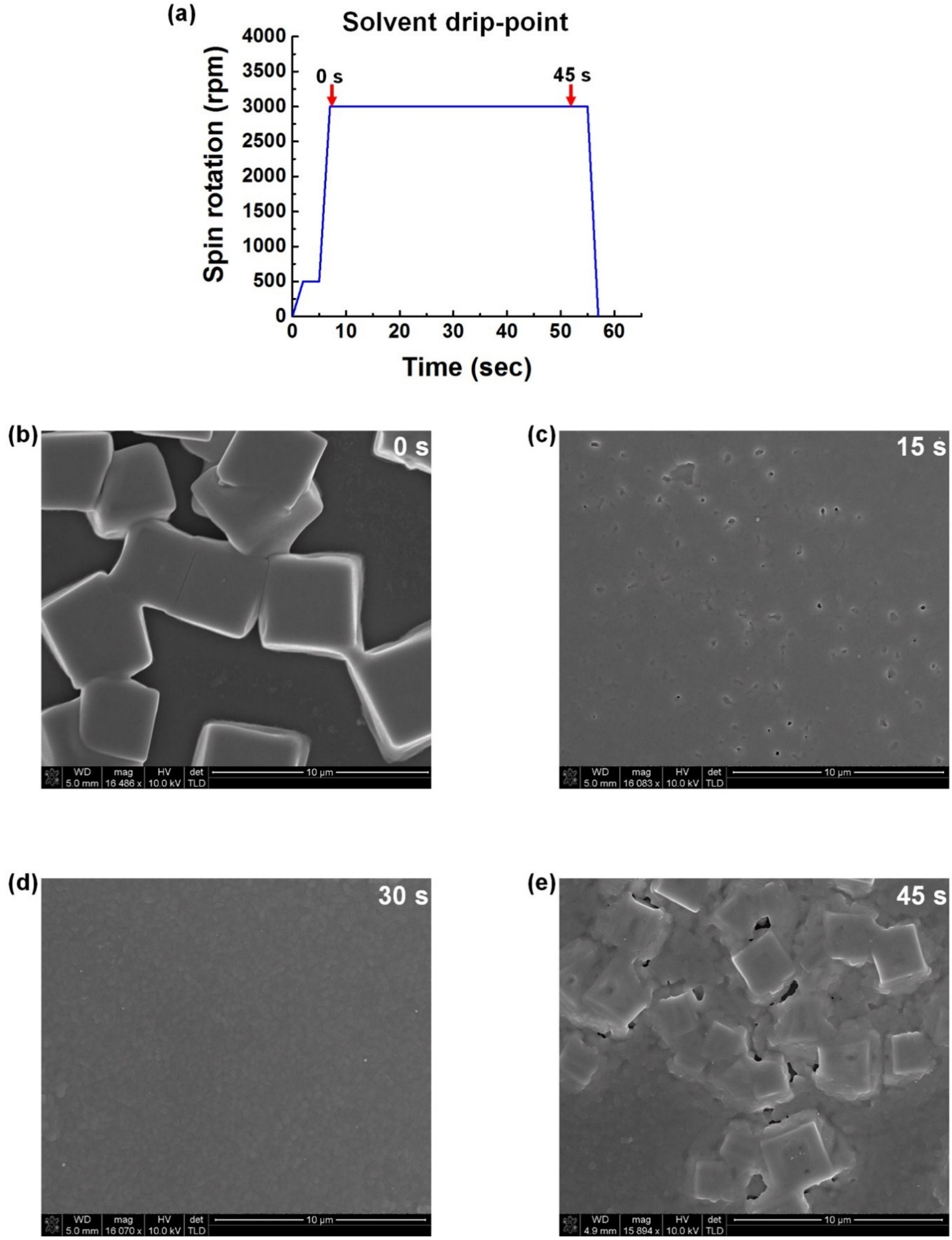


**Figure S3.** (a) Speed-time profile of spin-coating process for the solvent dropping method. (b-e) SEM images of $CH_3NH_3PbBr_3$ films prepared using chlorobenzene dropping after delays of 0 s (without dropping), 15 s, 30 s and 45 s after beginning the spin-coating step at 3,000 rpm.

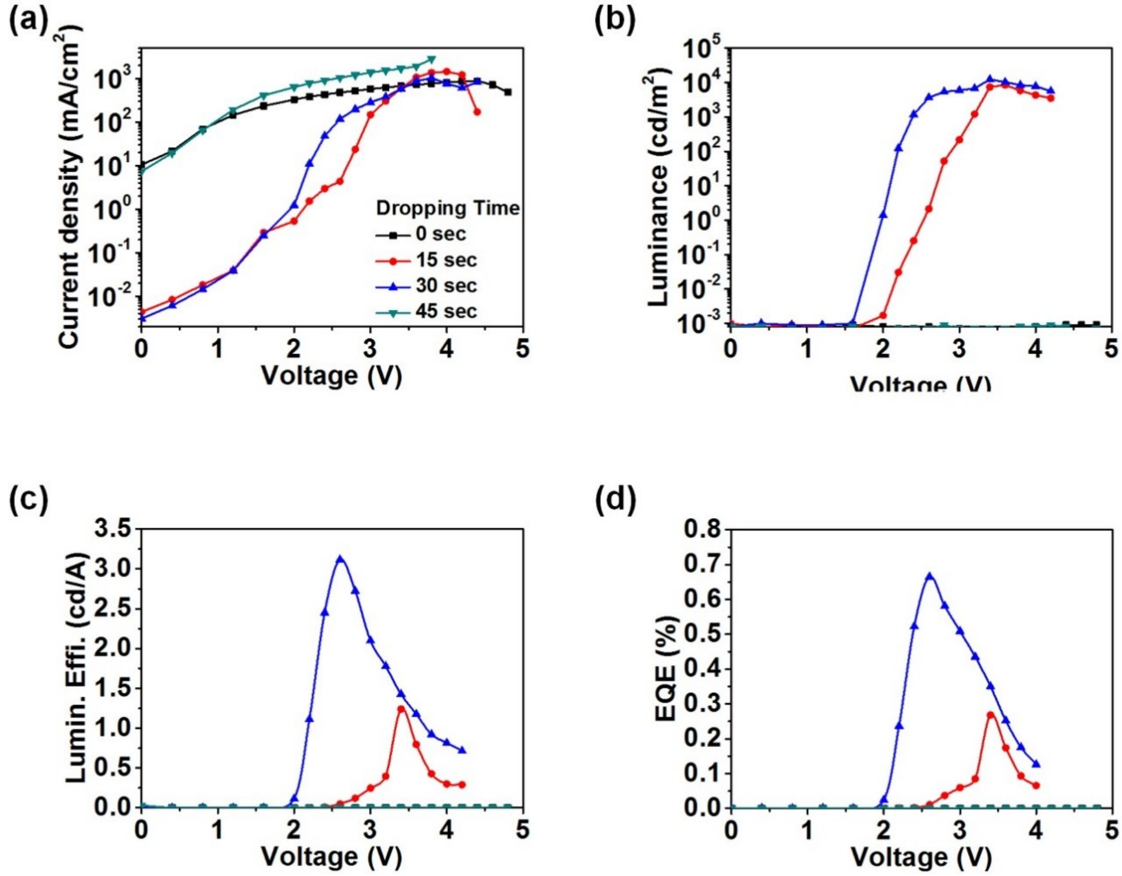


**Figure S4.** Light-emitting characterization of the PeLEDs with $CH_3NH_3PbBr_3$ films pre pared using chlorobenzene dropping after delays of 0 s (without solvent dropping), 15 s, 30 s and 45 s after beginning the spin-coating step at 3,000 rpm in terms of the ( a) current density *vs.* voltage (*J*-*V*), (b) luminance *vs.* voltage (*L*-*V*), (c) luminous effi ciency *vs.* voltage (*LE*-*V*), and (d) external quantum efficiency *vs.* voltage (*EQE*-*V*).

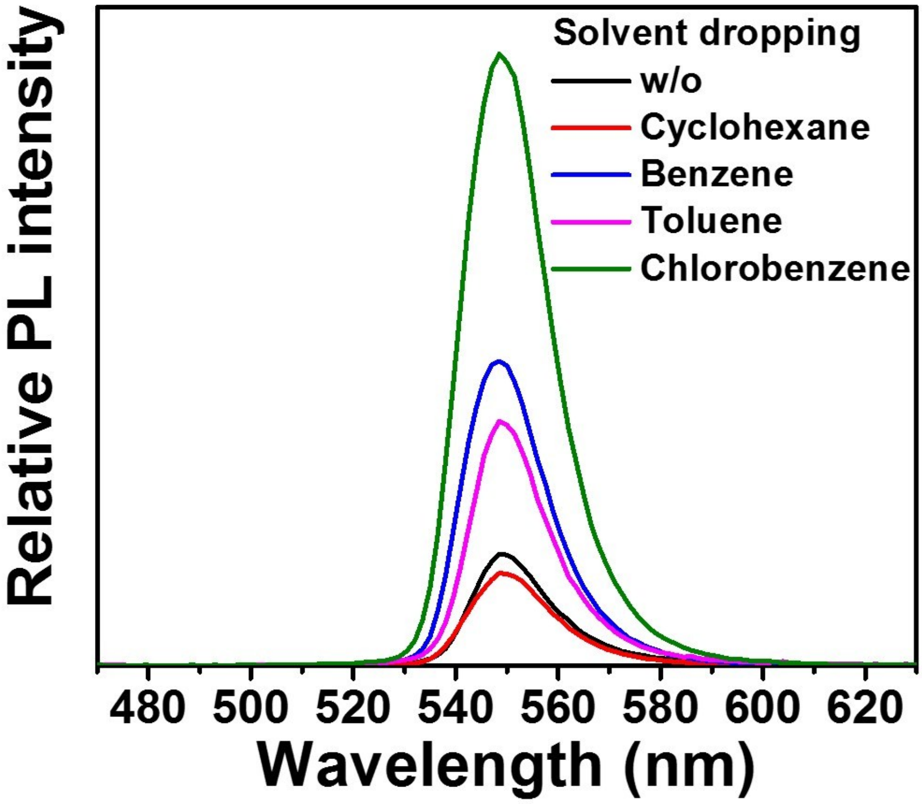


**Figure S5.** PL spectra for $CH_3NH_3PbBr_3$ films prepared using various solvents dropped on a quartz substrate with PMMA as the encapsulation layer.

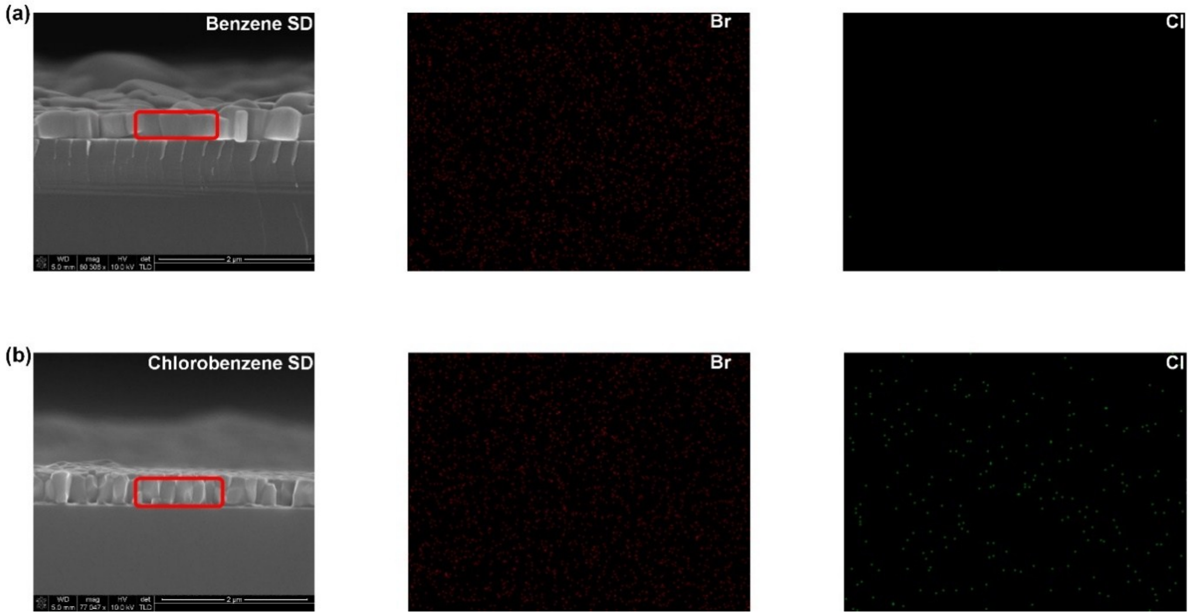


**Figure S6.** Cross-sectional SEM images of $CH_3NH_3PbBr_3$ films prepared using (a) benzene and (b) chlorobenzene dropping and elemental mappings of bromine and chlorine within $CH_3NH_3PbBr_3$ films by EDS.

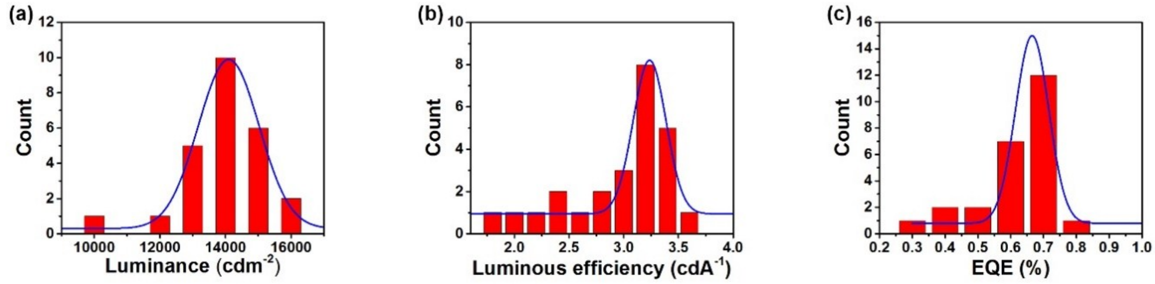


**Figure S7.** Histograms for each value of (a) luminance, (b) luminous efficiency and (c) EQE of 25 samples from PeLEDs (ITO/PEDOT:PSS/$CH_3NH_3PbBr_3$ prepared by chlorobenzene dropping/TPBi/LiF/Ag).

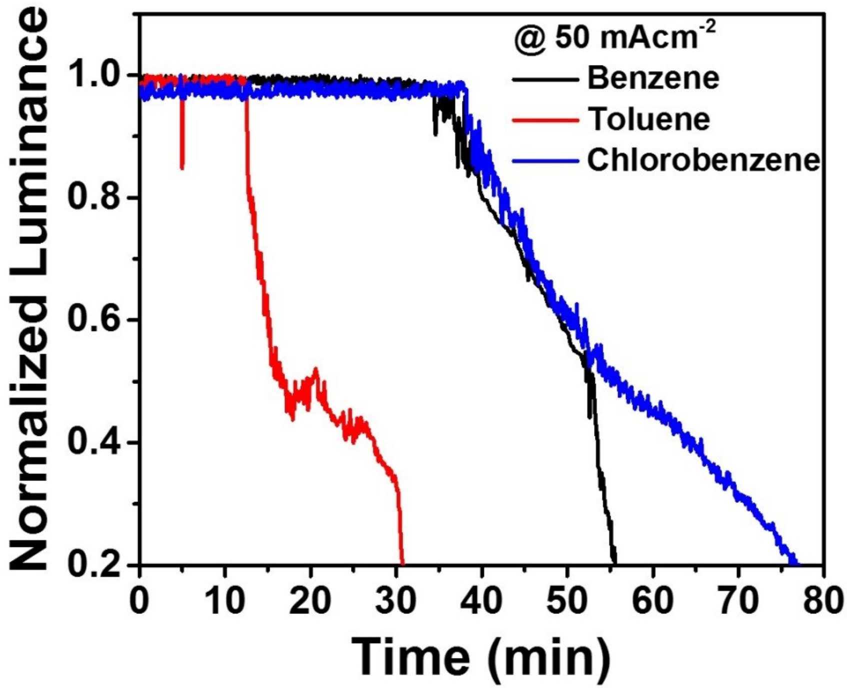


**Figure S8**. The long-term stability of encapsulated PeLEDs with $CH_3NH_3PbBr_3$ film using benzene, toluene, and chlorobenzene drop-casting method were evaluated in terms of normalized luminance under ambient air conditions.

**Table S1.** Summary of the solvent polarity indexes.

| Solvent | Polarity index |
|---|---|
| Cyclohexane | 0.004 |
| Benzene | 3.0 |
| Toluene | 2.3 |
| Chlorobenzene | 2.7 |

**Table S2.** Summary of the device performances of PeLEDs with $CH_3NH_3PbBr_3$ films prepared using chlorobenzene dropping after various delay times after beginning the spin-coating step at 3,000 rpm.

| Device configuration (ITO/PEDOT:PSS/$CH_3NH_3PbBr_3$ (Chlorobenzene dropping)/TPBi/LiF/Ag) | $L_{max}$ [cd/m$^2$] @ bias | $LE_{max}$ [cd/A] @ bias | $EQE_{max}$ [%] @ bias |
|---|---|---|---|
| Dropping Time 0 s | - | - | - |
| Dropping Time 15 s | 8,490 @ 3.6 | 1.24 @ 3.4 | 0.27 @ 3.4 |
| Dropping Time 30 s | 12,330 @ 3.4 | 3.12 @ 2.6 | 0.67 @ 2.6 |
| Dropping Time 45 s | - | - | - |