Supplementary Information for DEP-Assisted Trapped-Assembly Method for Uniform and Reliable Assembly of Fin-LEDs in Next-Generation Displays

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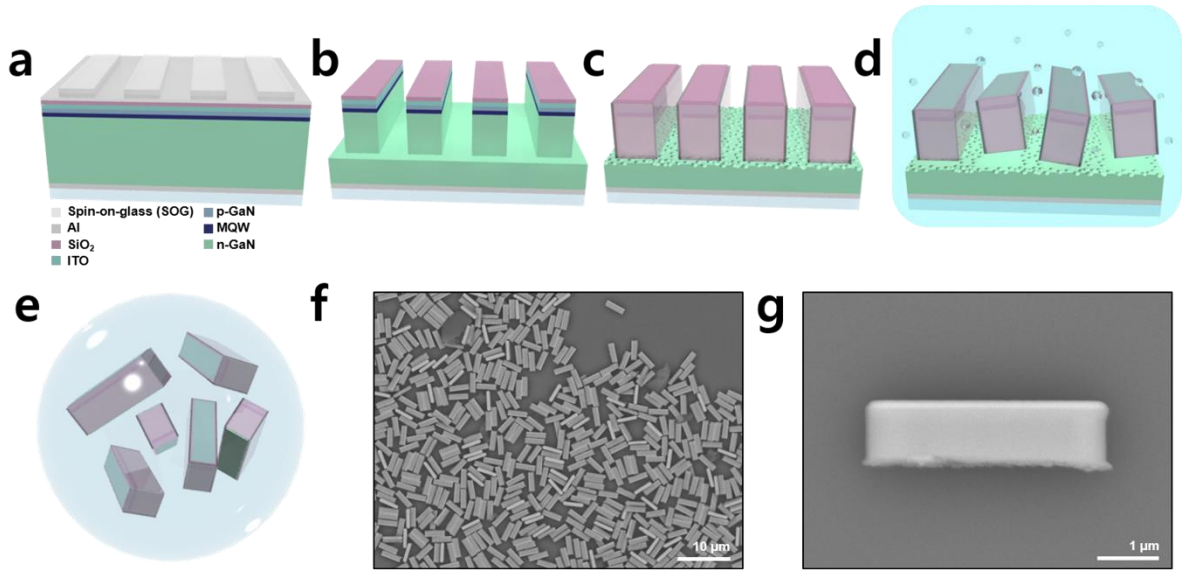

Fig. S1. Schematic diagram and electron microscopy images of each step of the process for fabricating individually separated fin-LEDs: **a** nanoimprinting, **b** dry and wet etching, **c** passivation, **d** electrochemical etching, and **e** separated fin-LEDs from sapphire substrate. **f** Low-magnified and **g** high-magnified FE-SEM image of separated fin-LEDs.

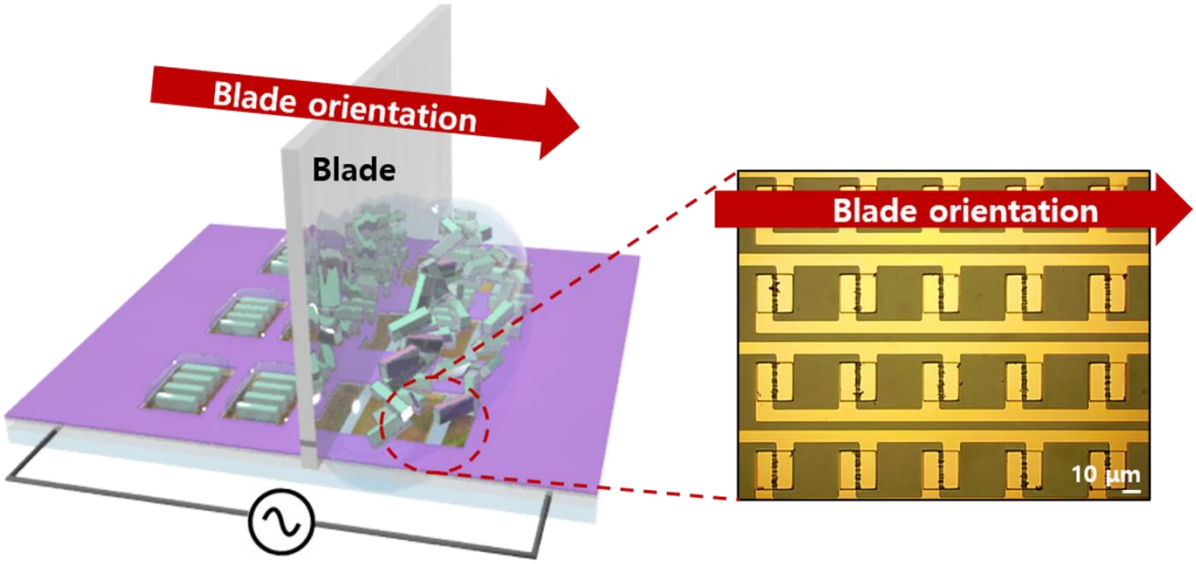

Fig. S2. Schematic diagram of the blade orientation of the trapped-assembly process

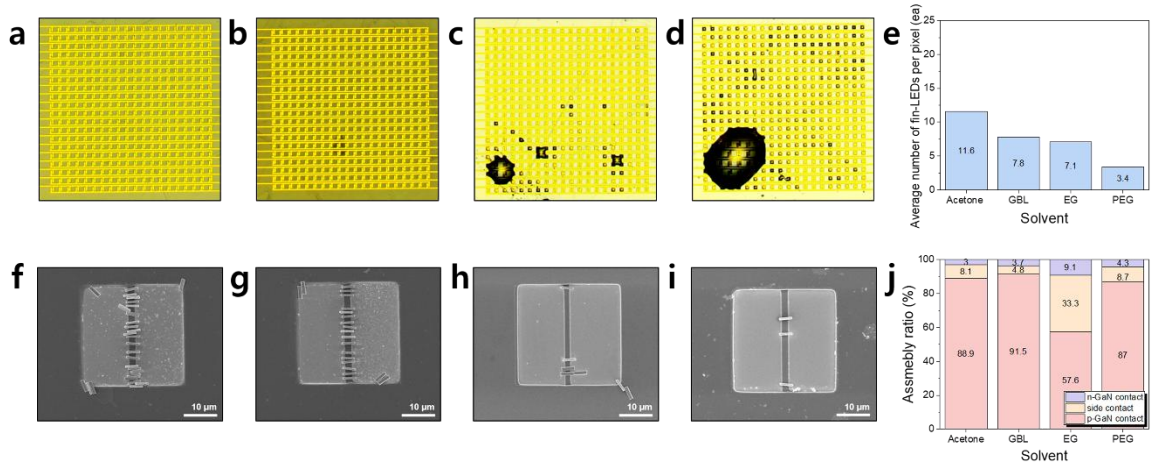

Fig. S3. Optical microscope images of assembled fin-LEDs on bare PDL using different solvents: **a** acetone, **b** GBL, **c** ethylene glycol, and **d** polyethylene glycol. **e** Average number of fin-LEDs per pixel aligned using each solvent-based fin-LED ink. SEM images of assembled fin-LEDs using different solvents: **f** acetone, **g** GBL, **h** ethylene glycol, and **i** polyethylene glycol. **j** Assembly ratio of fin-LEDs using various ink solvents.

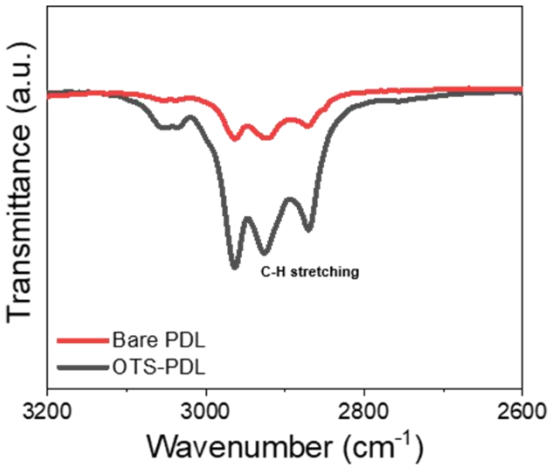

Fig. S4. FT-IR spectrum of the bare PDL and OTS SAM treatment on the PDL.

Table S1. Various characteristics of the selected solvents for fin-LED inks.

Solvent	Electrical conductivity [μS m^{-1}]	Viscosity [cP (25℃)]	Vapor pressure [mmHg]	Dielectric constant
Acetone	20	0.3	200	20.7
GBL	0.1-1	1.7	0.45	42.0
EG	107	16.1	0.06	37.0
PEG	314	50		22.0

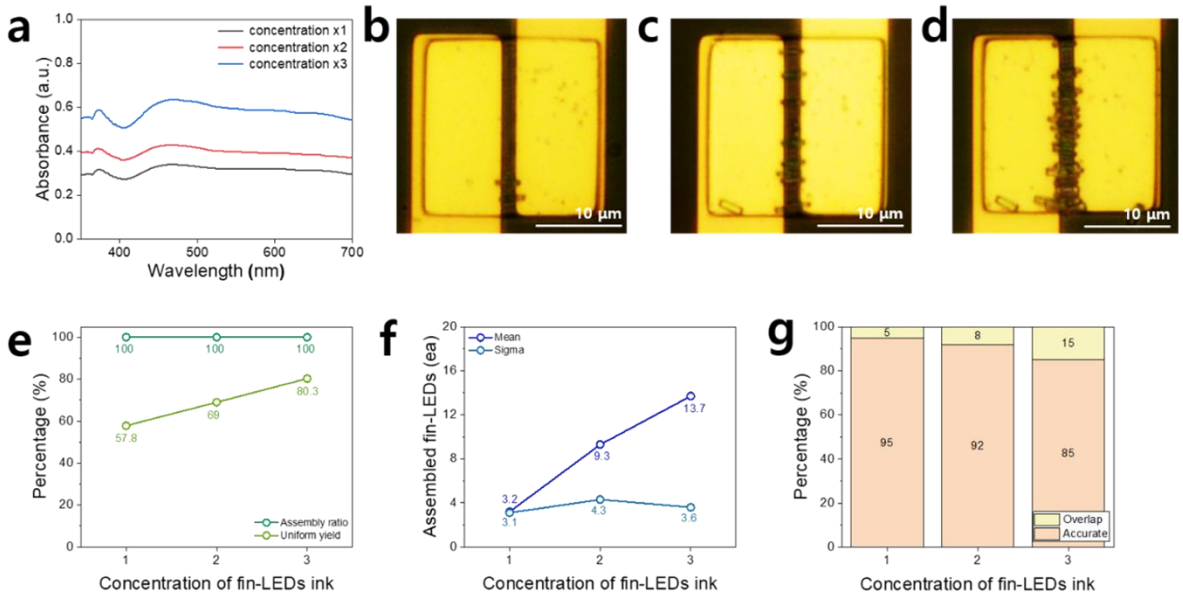

Fig. S5 a. UV-vis spectra of fin-LEDs inks with different concentrations. Optical microscope images of assembled fin-LEDs using **b.** x1, **c.** x2, and **d.** x3 concentration fin-LEDs inks. **e.** Assembly ratio and high uniform yield as a function of fin-LEDs inks with varying concentrations. **f.** Mean and standard deviation (sigma) of the number of assembled fin-LEDs per pixel for fin-LEDs inks with varying concentrations. **g.** Ratio of overlapped fins and accurately aligned fin-LEDs for fin-LEDs inks with varying concentrations.

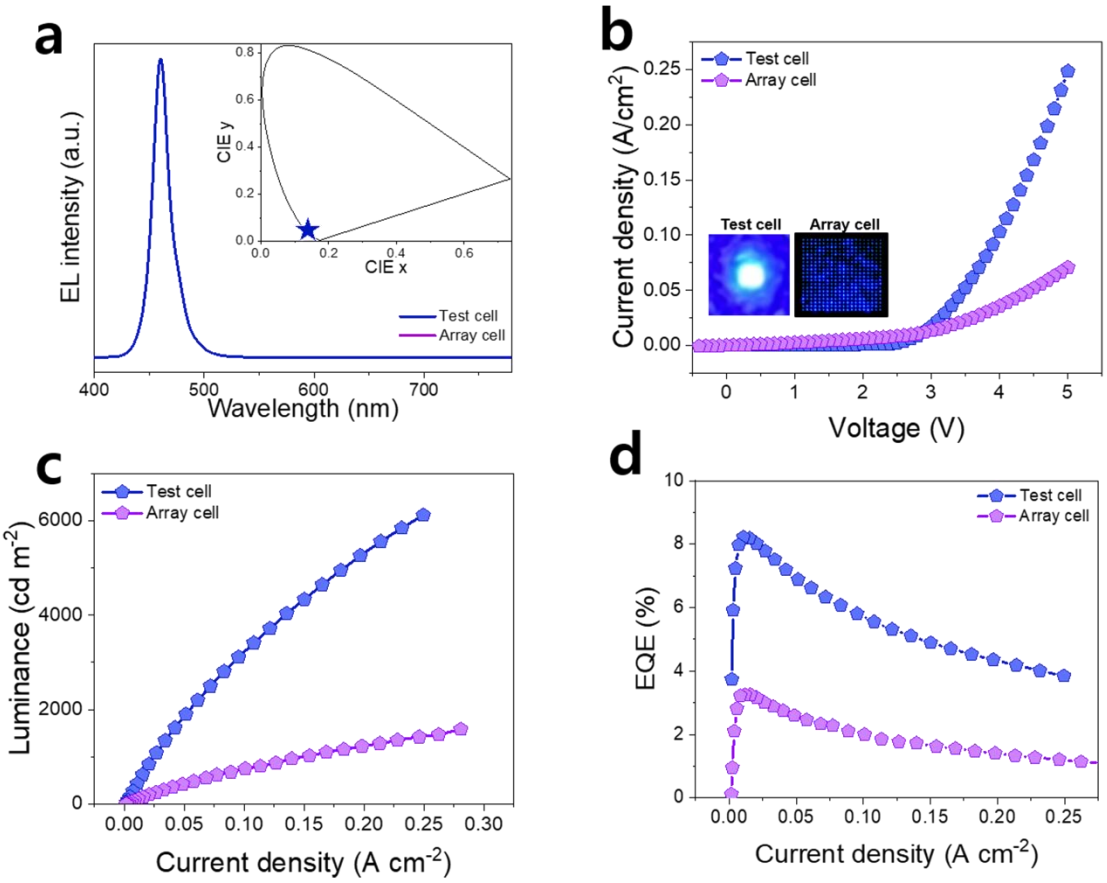

Fig. S6. EL characteristics of array cell fin-LED device with 400 pixels and test cell fin-LED devices, the light emitting area was 1 × 1 mm^2, of **a** EL spectra, and CIE color coordinates, **b** Current-voltage (I-V) from 0 to +5 V range and emission images (inset), **c** Luminance-current density (L-J), and **d** External quantum efficiency (EQE)-current density.

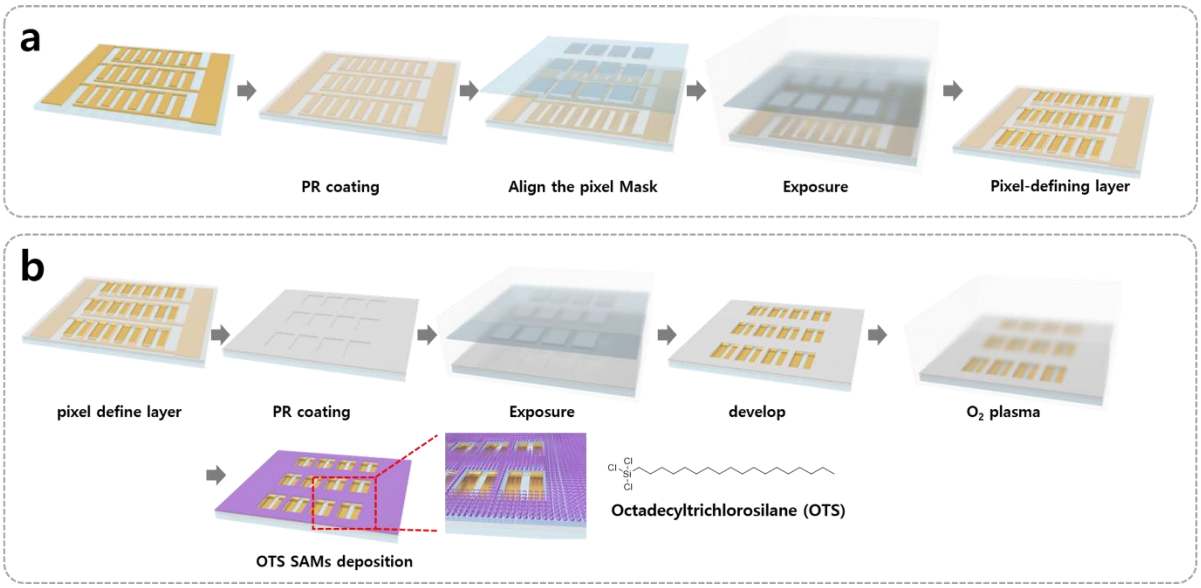

Fig. S7. a Fabrication process of the PDL and **b** OTS SAMs treatment on the PDL.