

## Supporting Information

Highly Promoting the Performances of Polymer Light-Emitting diodes  
via Control of the Residue of a Polar Solvent on an Emissive layer

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### Experimental details

Methanol and DMF were both purchased from Sigma-Aldrich and used as received. Prior to device fabrication, ITO coated glass substrate underwent a wet-cleaning course in an ultrasonic bath sequentially in detergent, deionized water, acetone and ethanol 20 mins for each course. Then, it was baked in oven at 100 °C for 2 hours. Before the coating of PEDOT: PSS, 4 min. O<sub>2</sub> plasma treatment with a power of 70 W was applied on the substrate. 30 nm of PEDOT: PSS film was spin-coated

onto the ITO surface, and it was baked at 120 °C for 10 mins to remove the residual water. Following that, emissive layer (EML) P-PPV was spin-coated with about 70 nm in thickness determined by profilometry (Bruker DektakXT), and solvent treatment was carried out by spin-coating solvent on top of P-PPV. Finally, LiF (1 nm) and Al (150 nm) were evaporated sequentially as the cathode at a basic pressure of  $3 \times 10^{-4}$  Pa. The active emission area defined by a shadow mask was 0.1 cm<sup>2</sup>. Except for the coating of PEDOT: PSS, all the other processes were carried out in a N<sub>2</sub> atmosphere dry box (Mikrouna). The control device without solvent treatment was also fabricated and tested under the same conditions.

After the fabrication of PLEDs, the devices were not encapsulated and the ensuing performances measurements were carried out in a N<sub>2</sub> atmosphere dry box with the concentration of oxygen and water less than 1ppm. The current density-operation voltage-luminance (J-V-L) and luminous efficiency- current density (LE-J) data were collected by a Keithley 2400 source meter and a calibrated silicon photodiode. The absorption spectra were measured by a UV-Vis spectrophotometer (UV3600). The emission spectra were tested by a PR-650 SpectraScan Spectrophotometer (Photo Research). The atomic force microscopy (AFM) images were detected by a scanning probe microscopy (Dimension Icon). The KPFM measurements were performed with on Park XE-120 scanning probe microscope in N<sub>2</sub> atmosphere glove-box. The contact potential difference (CPD) images were obtained on a 2×2 μm area, over which the averaged CPD values are used. UPS measurements was carried out with PHI

Quanterra II (Japan). UPS analysis with a HeI (21.2 eV) gas discharge lamp was performed to characterize the valence states and the vacuum level.

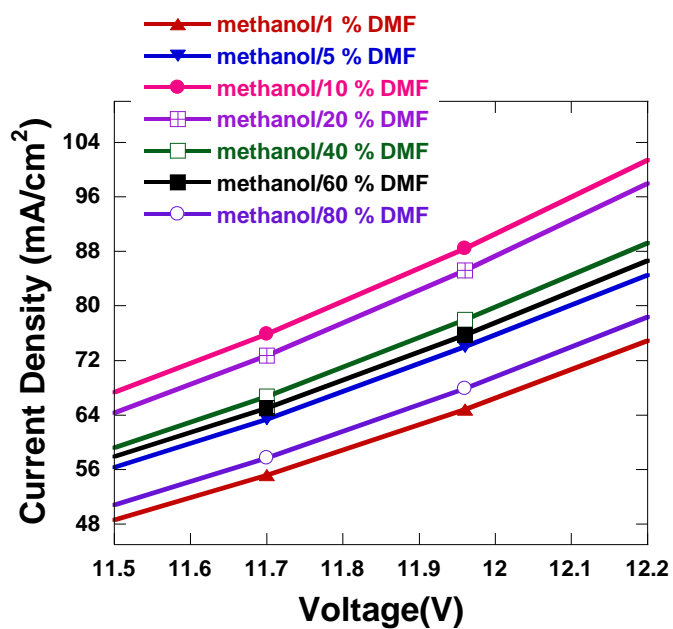


Figure S1. J-V curves of electron-only devices with solvent treatment by methanol/ x vol % DMF (x=1, 5, 10, 20, 40, 60, 80)

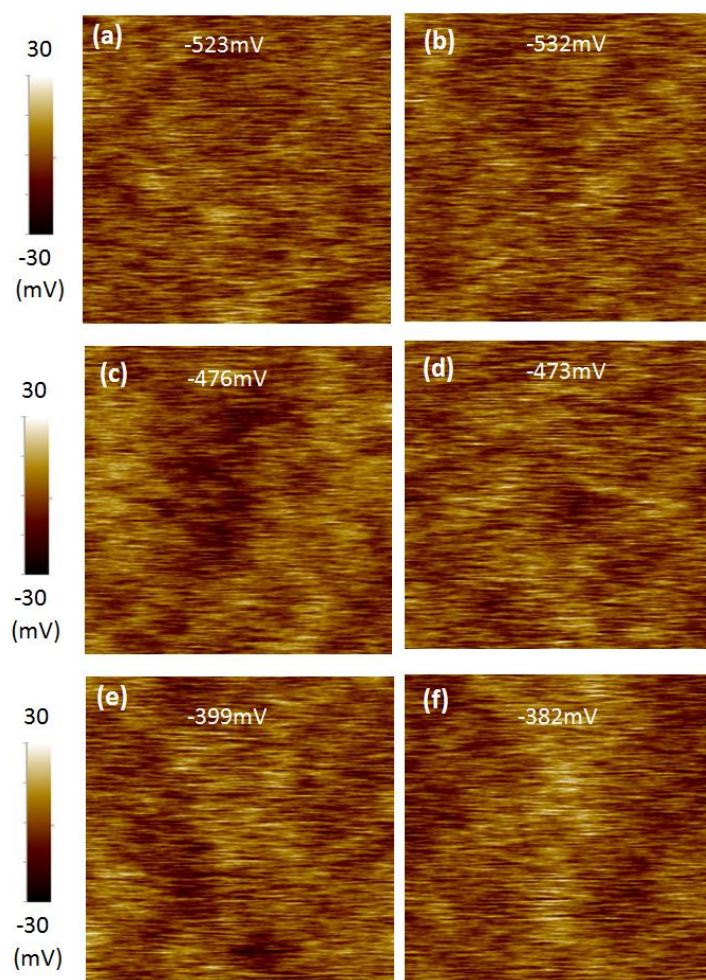


Figure S2. The contact potential difference (CPD) images of EML P-PPV, untreated (a and b), treated by methanol (c and d) and treated by DMF (e and f).

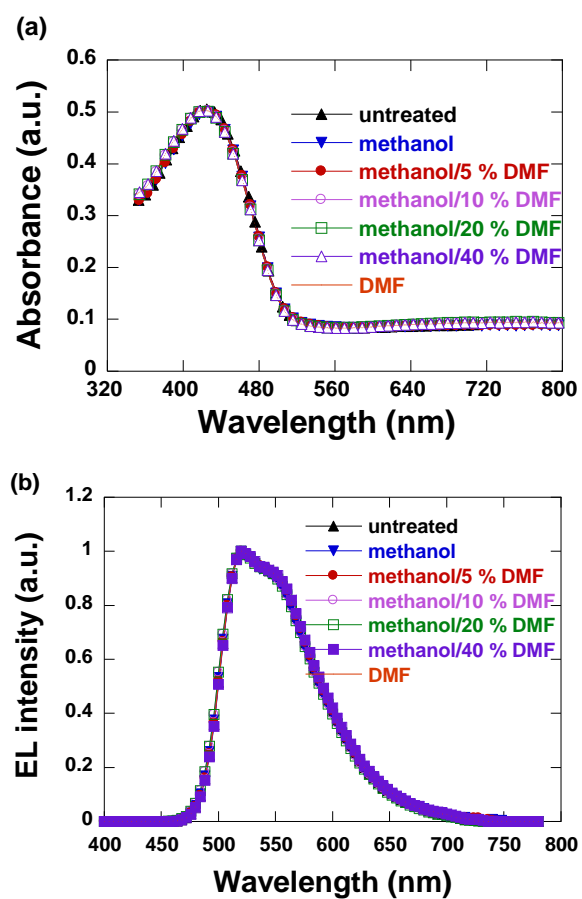


Figure S3. (a) The UV-Vis spectra of emissive layers and (b) electroluminescence (EL) spectra of PLEDs, with or without solvent treatment.

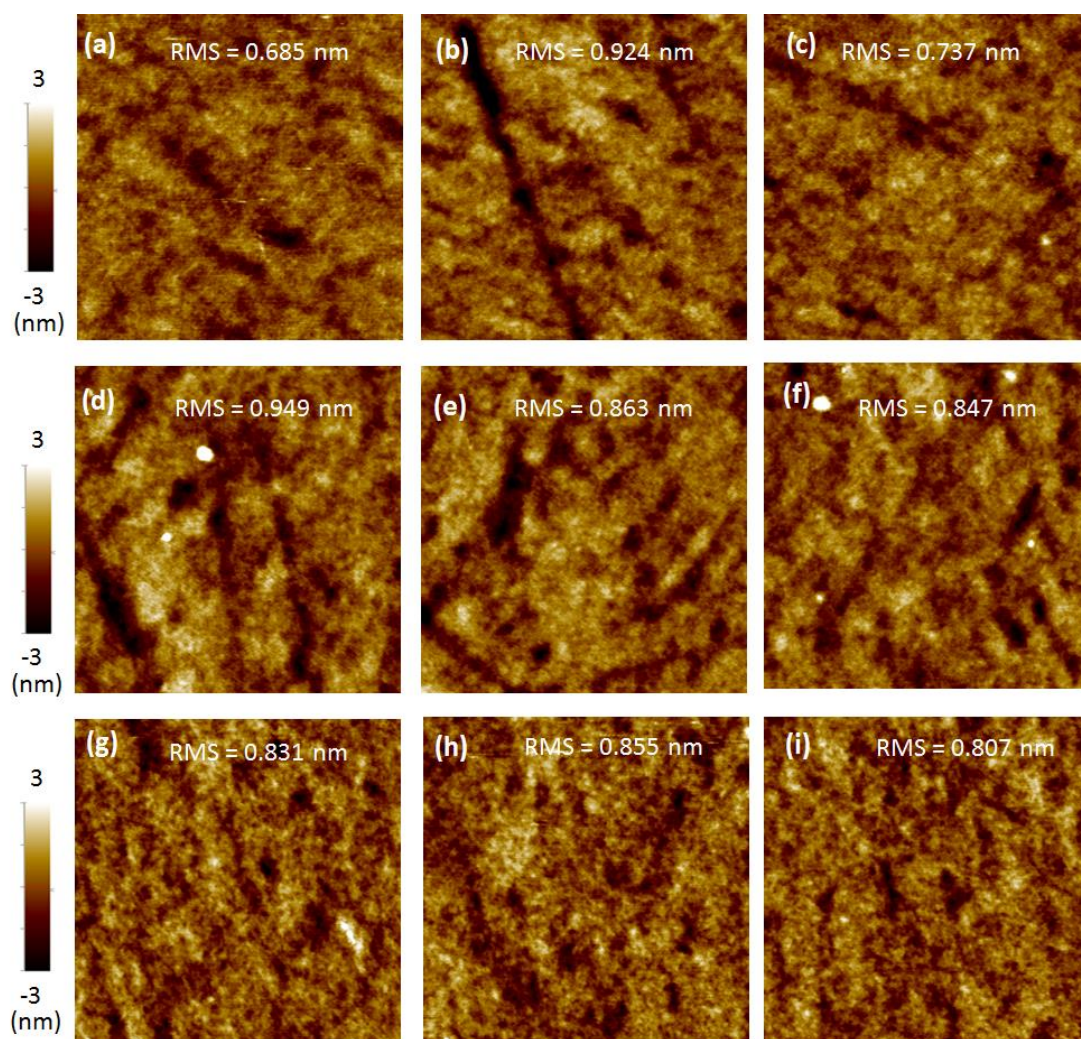


Figure S4. AFM images of the emissive layer across  $2 \times 2 \mu\text{m}$  area without solvent treatment (a, b and c), treated by methanol (d, e and f) and treated by DMF (g, h and i). The value of root mean square (RMS) roughness of each image was also showed.

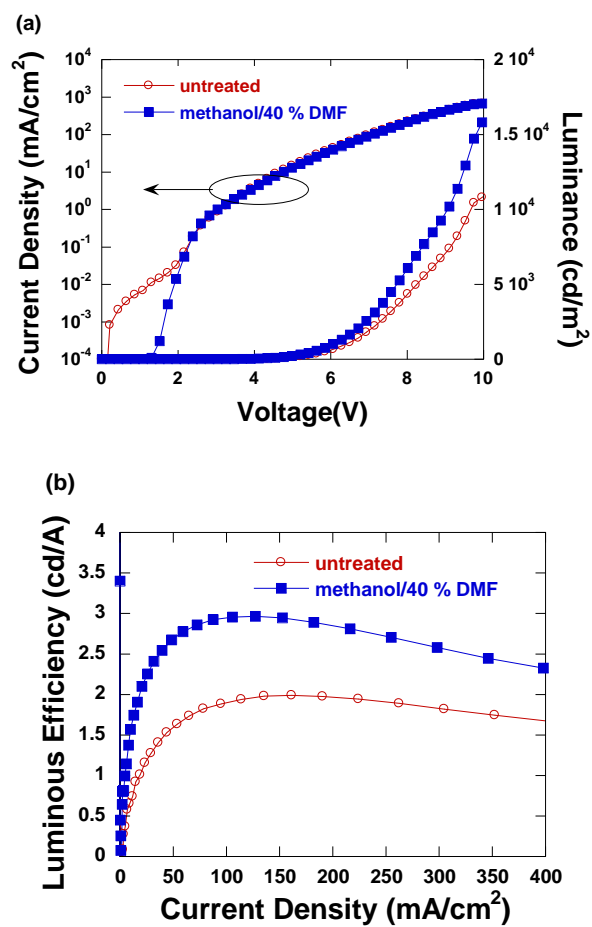


Figure S5. The J-V-L (a) and LE-J (b) characteristic of pre-annealed PLEDs at 120 °C for 10 mins with or without methanol/ 40 vol % DMF treatment.