

Supporting Information for

Organic-inorganic hybrid perovskite quantum dot light-emitting diodes using graphene electrode and modified PEDOT:PSS

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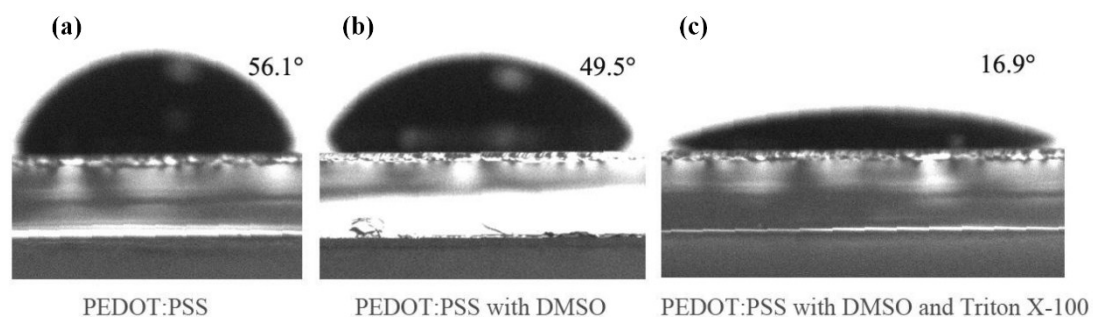


Fig. S1 Optical microscopy images and corresponding contact angles of (a) PEDOT:PSS, (b) PEDOT:PSS with 2 vol% DMSO, and (c) PEDOT:PSS with 2 vol% DMSO and 0.05 wt% Triton X-100 solutions on graphene/glass substrates.

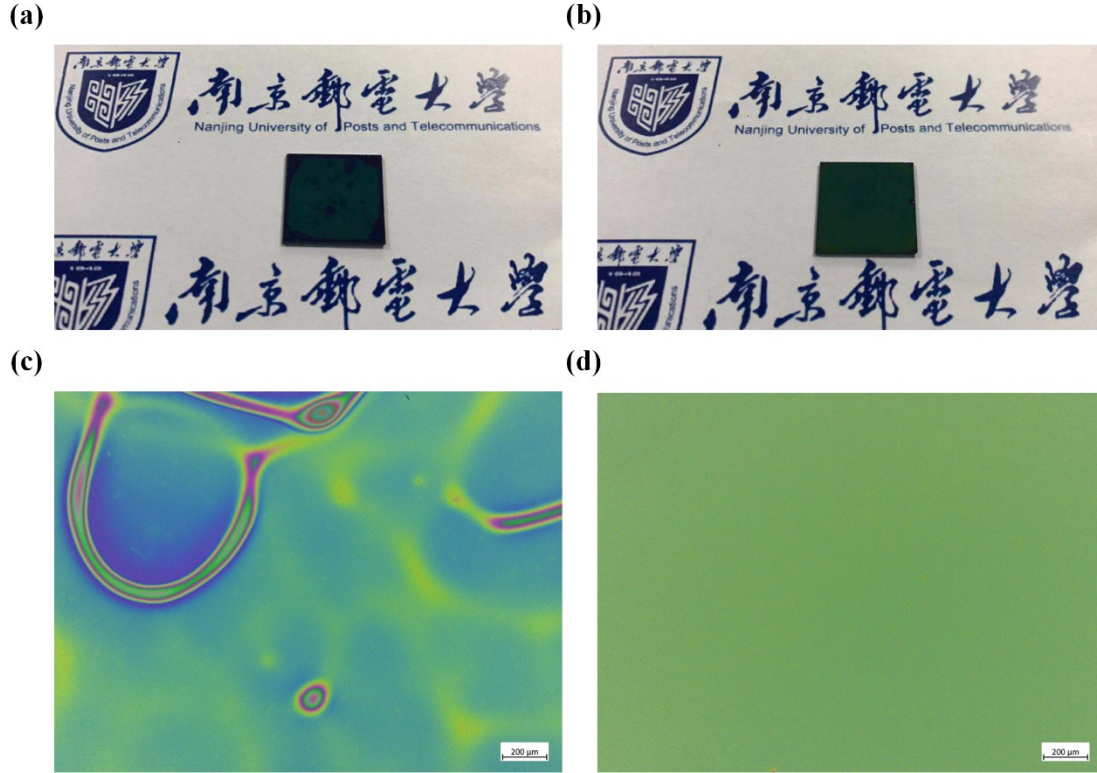


Fig. S2 Photographs of PEDOT:PSS films doped with (a) 2 vol% DMSO and (b) 2 vol% DMSO and 0.05 wt% Triton X-100. The Si/SiO₂ substrates need to treat 10 min with UV-ozone prior to the spincoating of the following PEDOT:PSS film. Optical microscope images of PEDOT:PSS films doped with (c) 2 vol% DMSO and (d) 2 vol% DMSO and 0.05 wt% Triton X-100.

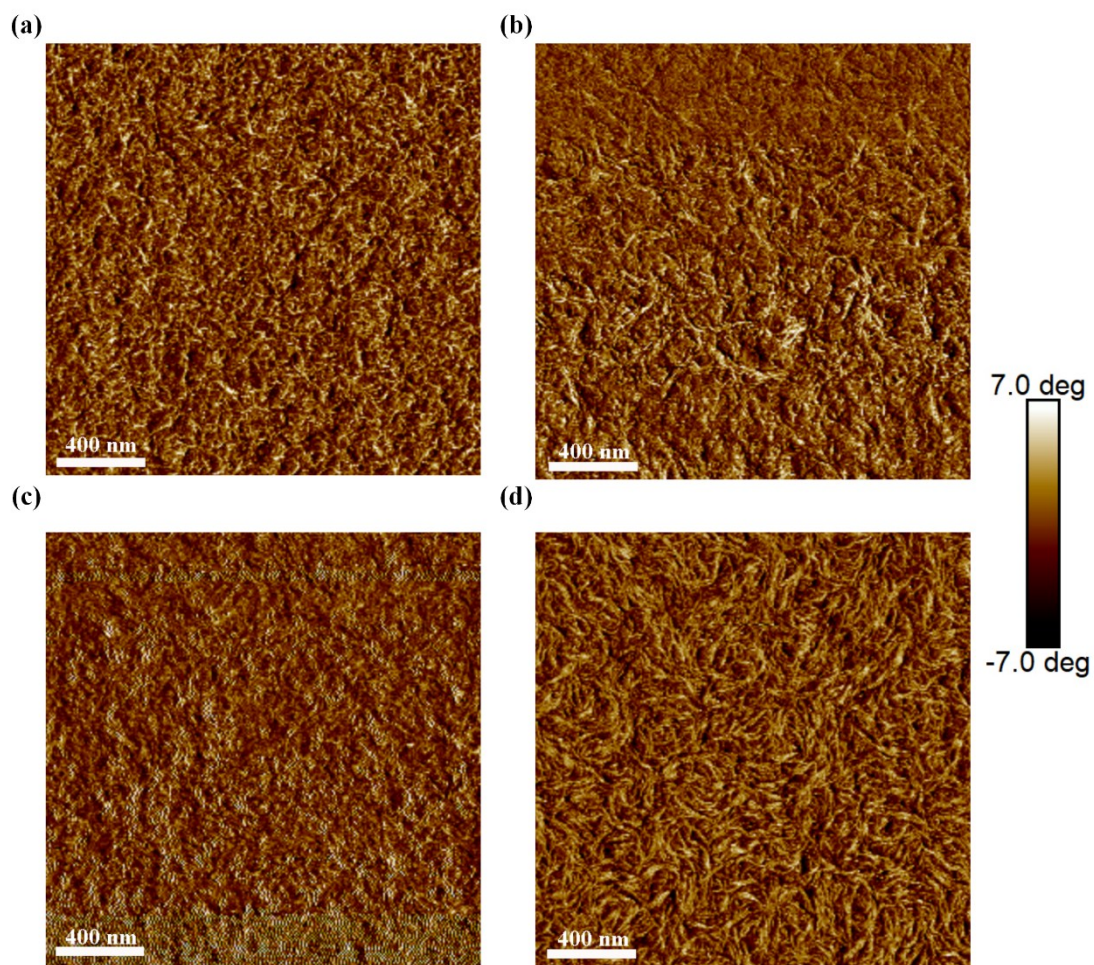


Fig. S3 AFM phase mode images of (a) the pristine PEDOT:PSS film and the PEDOT:PSS films doped with (b) 0.05 wt% Triton X-100, (c) 2 vol% DMSO, and (d) 0.05 wt% Triton X-100 and 2 vol% DMSO. All images have a size of $2\ \mu\text{m} \times 2\ \mu\text{m}$.

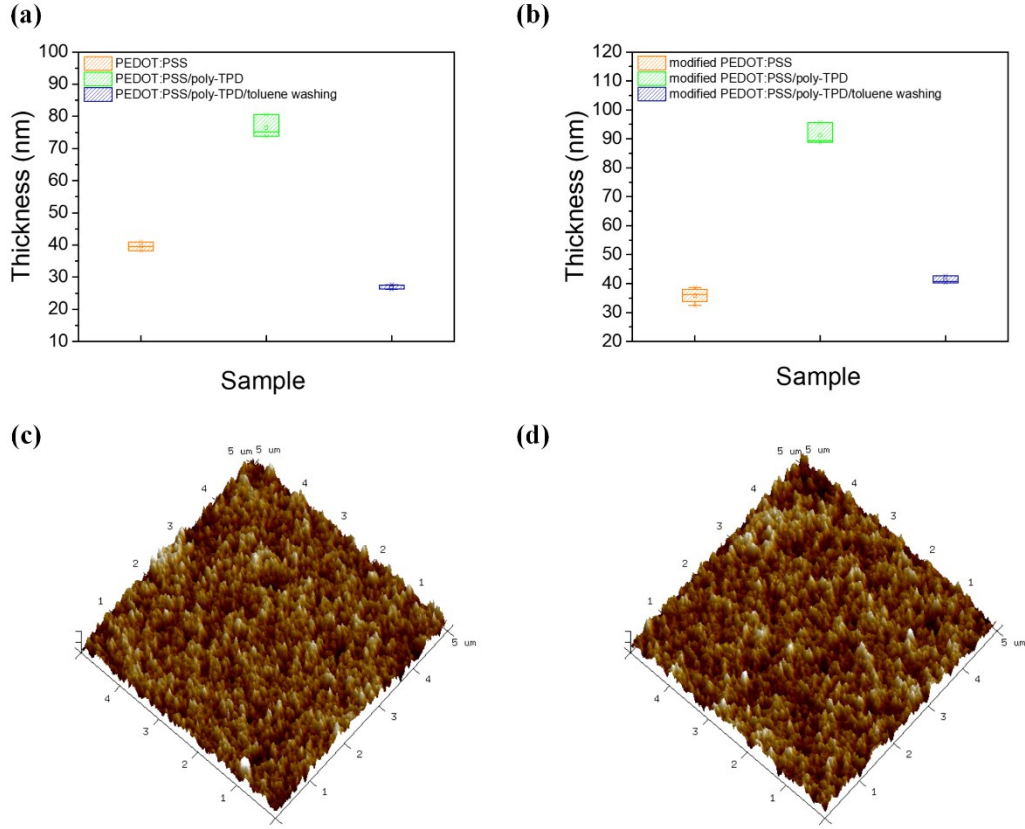


Fig. S4 Thickness statistics on (a) PEDOT:PSS, PEDOT:PSS/poly-TPD and toluene-washed PEDOT:PSS/poly-TPD films and (b) modified PEDOT:PSS, modified PEDOT:PSS/poly-TPD and toluene-washed modified PEDOT:PSS/poly-TPD films. The PEDOT:PSS and modified PEDOT:PSS solution were spin-coated onto the substrates at 2000 rpm for 45 s, followed by a thermal annealing of 120 °C and 30 min. The poly-TPD was spin-coated at 1500 rpm for 60 s, followed by a thermal annealing of 140 °C and 30 min. Finally, the pure toluene solution was spin-coated onto the poly-TPD layer at 2000 rpm for 45 s and this step was repeated three times. AFM images of (c) PEDOT:PSS/poly-TPD ($R_q=1.70$ nm) and (d) modified PEDOT:PSS/poly-TPD ($R_q=1.40$ nm) after washing with toluene.

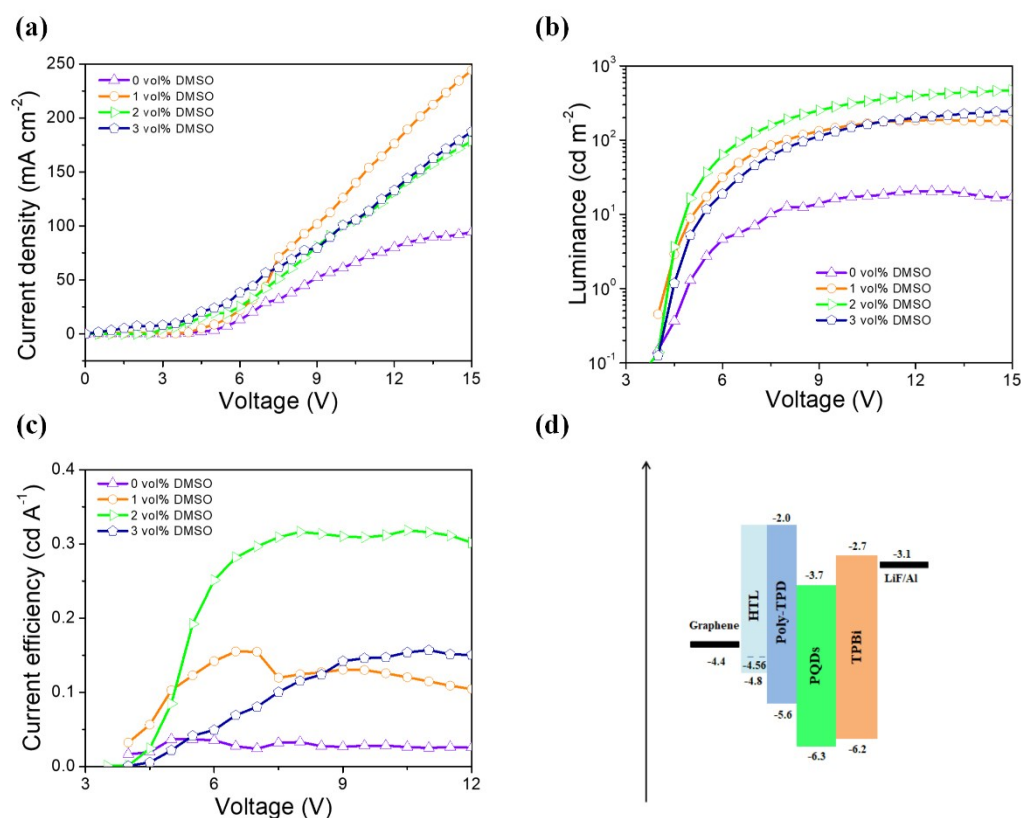


Fig. S5 (a) Current density, (b) luminance and (c) current efficiency curves of PQDs LEDs with 0.01 wt% Triton X-100 and various concentrations of DMSO. (d) The energy level diagram of our PQDs LEDs.

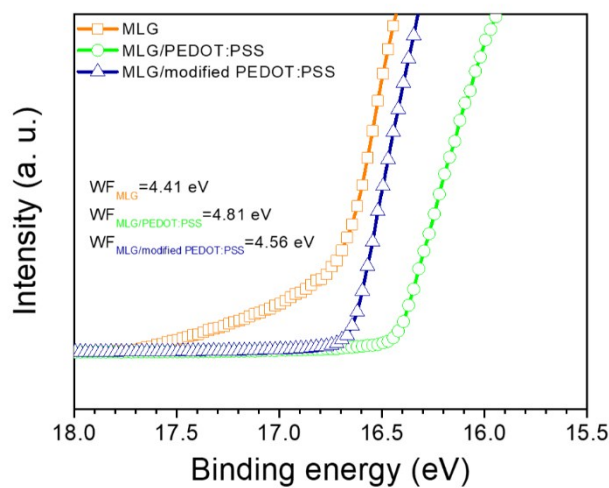


Fig. S6 Ultraviolet photoelectron spectroscopy of MLG, MLG/PEDOT:PSS and MLG/modified PEDOT:PSS.

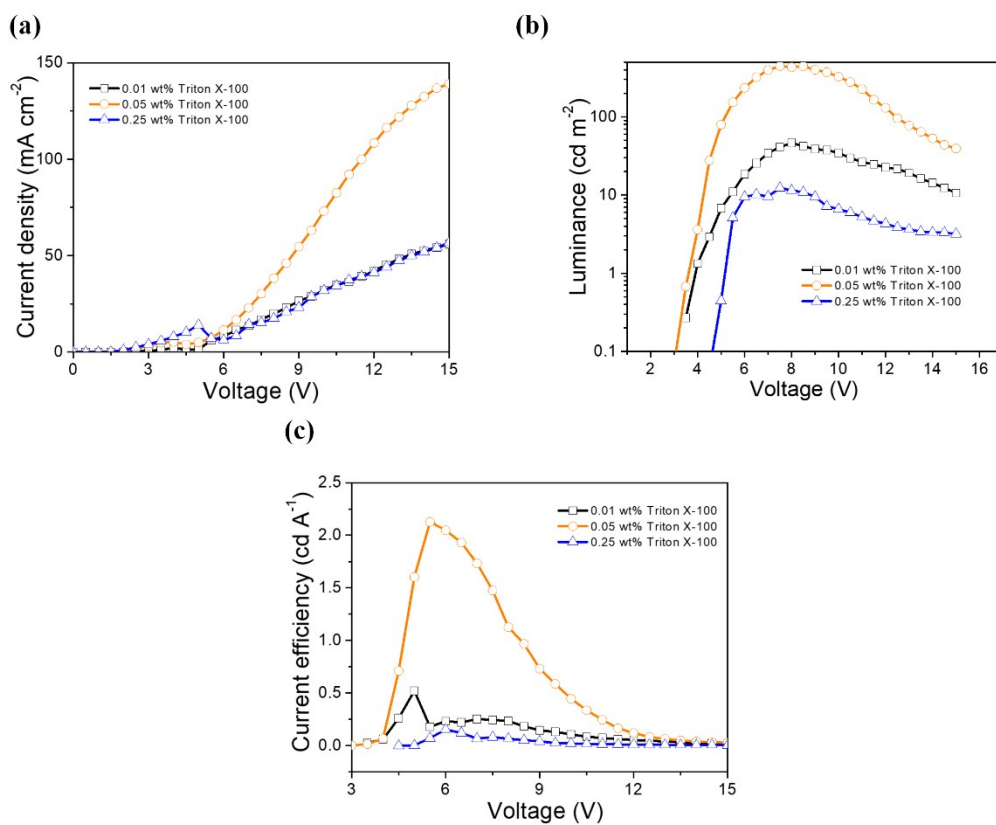


Fig. S7 (a) Current density, (b) luminance and (c) current efficiency curves of PQDs LEDs with 2 vol% DMSO and various concentrations of Triton X-100.

Table S1 Device parameters with different Triton X-100 doping concentrations.

Triton X-100 [wt%]	V_{on} [V]	L_{max} [cd m ⁻²]	CE_{max} [cd A ⁻¹]
0.01	4	46.4	0.52
0.05	3.8	431.2	2.12
0.25	5.1	11.5	0.15