

Electronic Supplementary Information (ESI)

Effect of Urchin-Like Gold Nanoparticles in Organic Thin-Film Solar Cells

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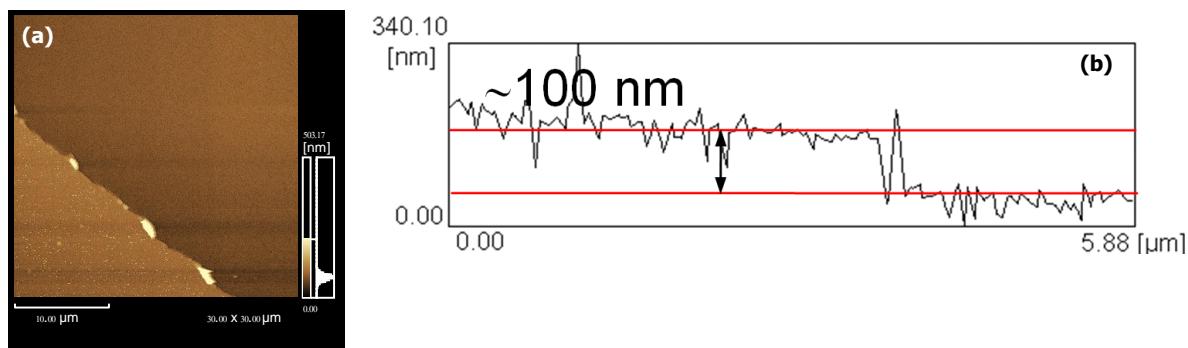


Fig. S1 (a) AFM images of scratched PEDOT:PSS film on ITO glass and (b) height profile of PEDOT:PSS film-ITO glass surface. The average thickness is ca. 100 nm.

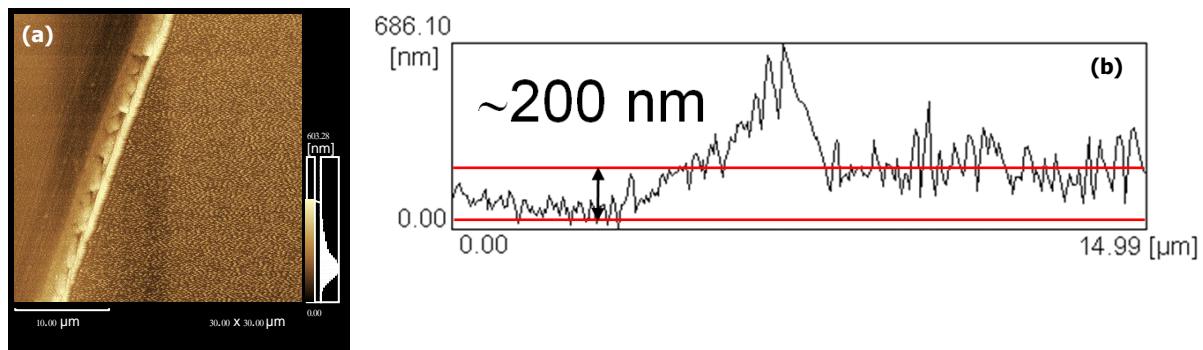


Fig. S2 (a) AFM images of scratched P3HT:PCBM/PEDOT:PSS on ITO glass and (b) height profile of P3HT:PCBM/PEDOT:PSS-ITO glass surface. The average thickness of P3HT:PCBM/PEDOT:PSS films is ca. 200 nm.

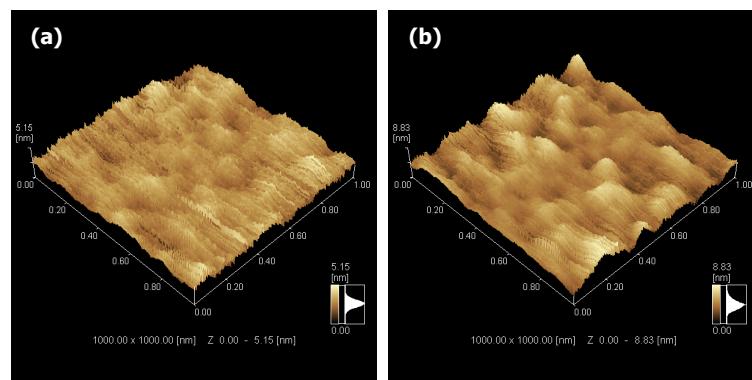


Fig. S3 AFM images of the P3HT:PCBM/PEDOT:PSS/ITO glass film surface (a) without UL-AuNPs and (b) with UL-AuNPs at 0.1 mM in the P3HT:PCBM layer.

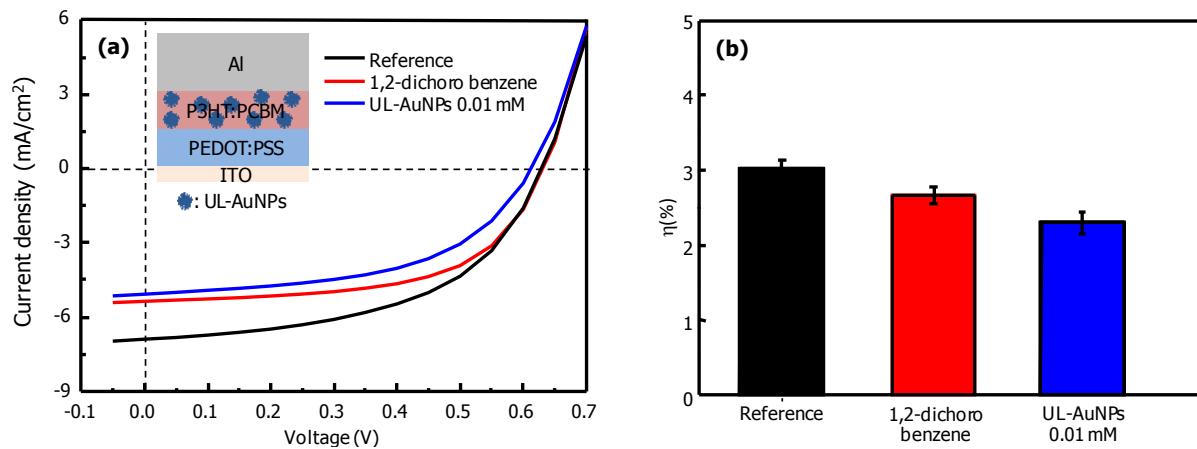


Fig. S4 (a) J-V properties of (i) reference cell without UL-AuNPs, (ii) reference cell blended with 1,2-dichloro benzene (without UL-AuNPs) in P3HT:PCBM layer, and (i) OSC blended with 0.01 mM UL-AuNPs (in 1,2-dichloro benzene) in P3HT:PCBM layer and (b) the solar cell efficiency (η (%)) of each OSC.

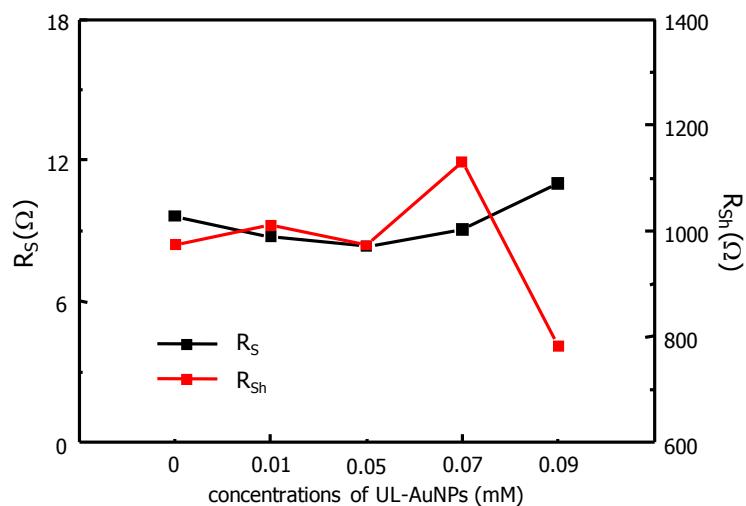


Fig. S5 The series resistance (R_s) and shunt resistance (R_{sh}) of OSCs blended with UL-AuNPs in PEDOT:PSS layer as a function of the concentration.

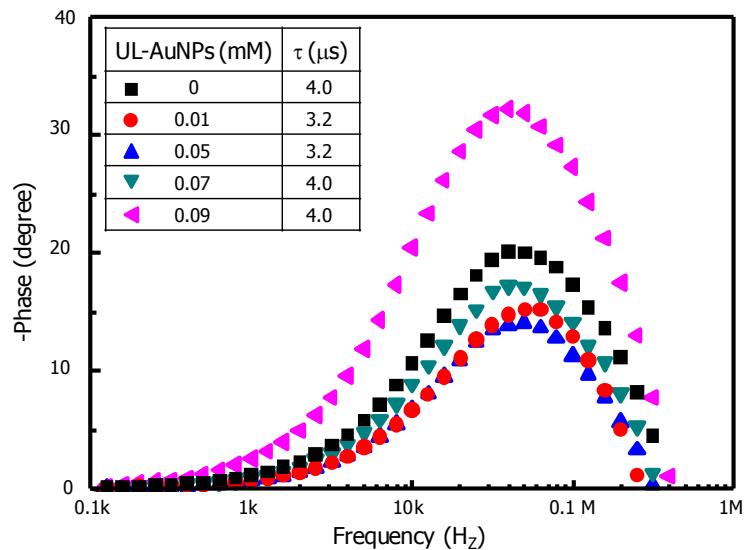


Fig. S6 Bode plots of OSCs at varied concentration of UL-AuNPs in PEDOT:PSS film. The insert table shows the electron lifetime (τ).

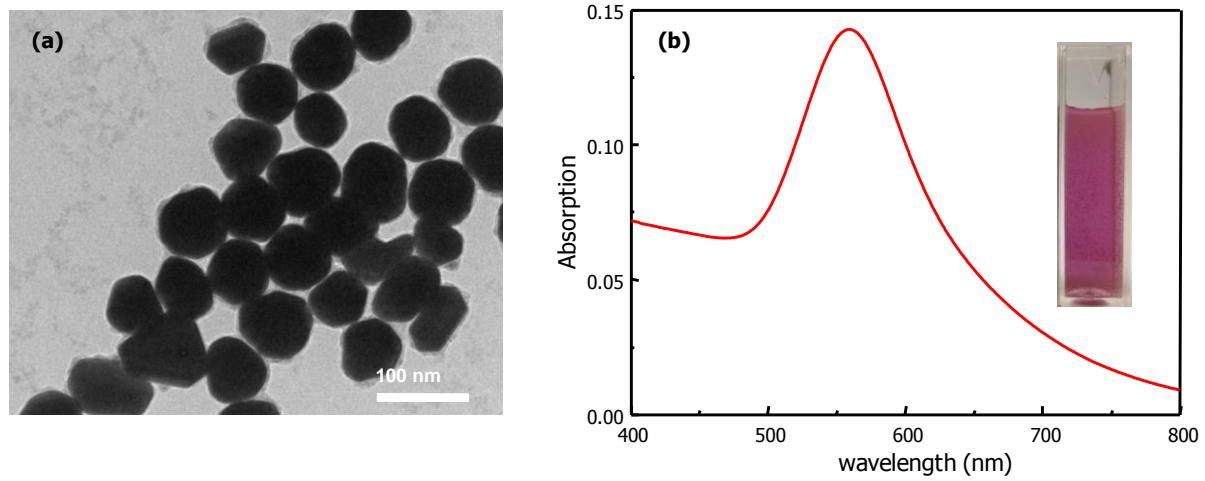


Fig. S7 (a) TEM images of spherical AuNPs and (b) the UV-vis spectrum of UL-AuNPs at 0.05 mM. The scale bar indicates 100nm.

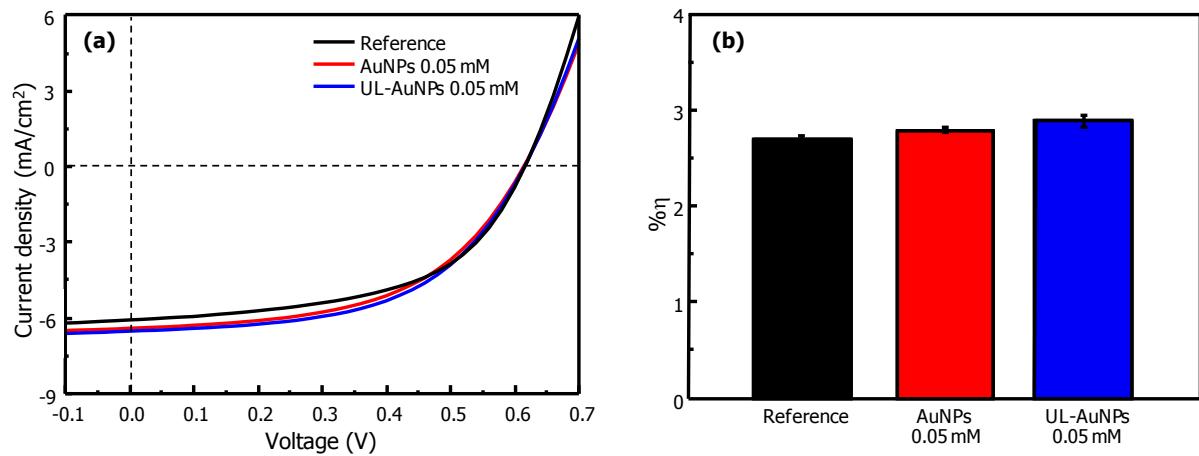


Fig. S8 (a) J-V characteristic of reference OSC (without gold nanoparticles), OSC with spherical UL-AuNPs in PEDOT:PSS film, and OSC with UL-AuNPs in PEDOT:PSS film, and (b) the solar cell efficiency ($\eta(\%)$)