

Supplementary Materials

Optical Manipulation of Incident Light for Enhanced Photon Absorption in Ultrathin Organic Photovoltaics

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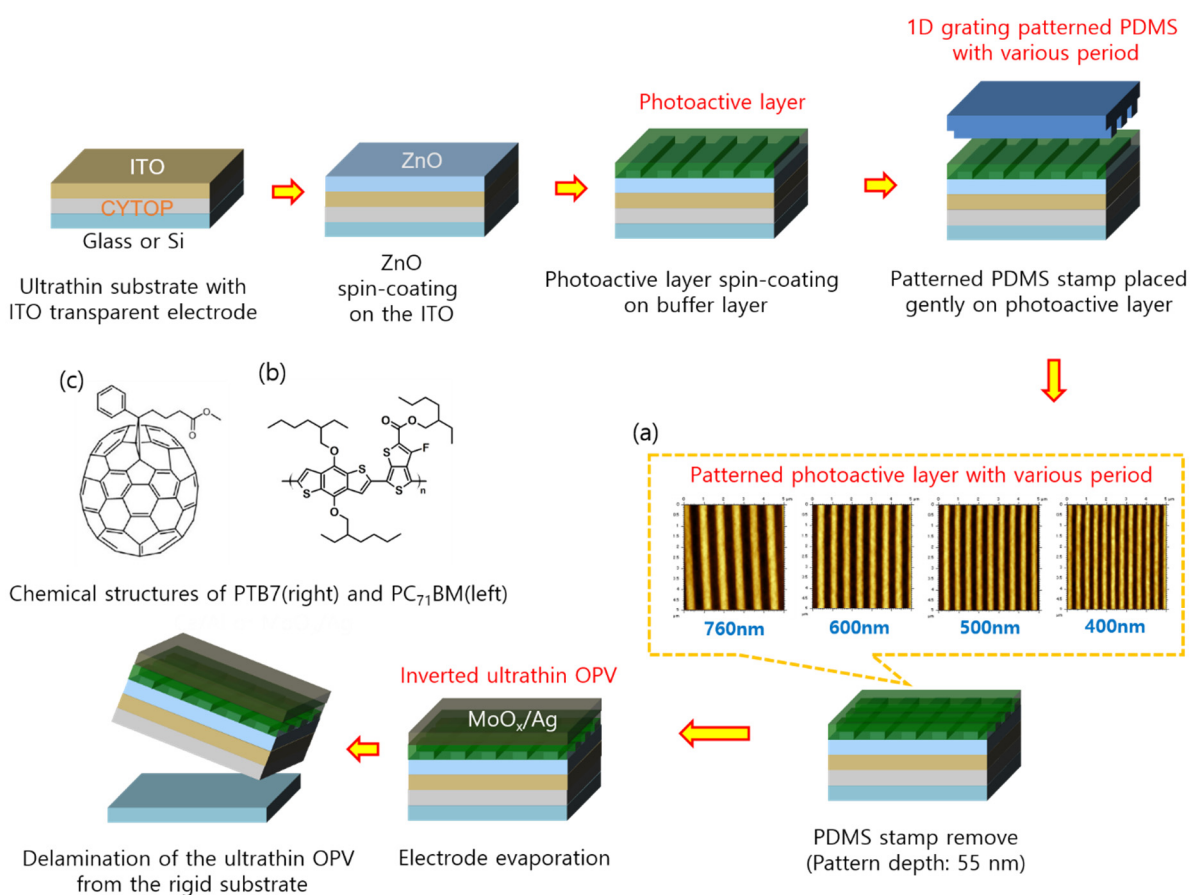
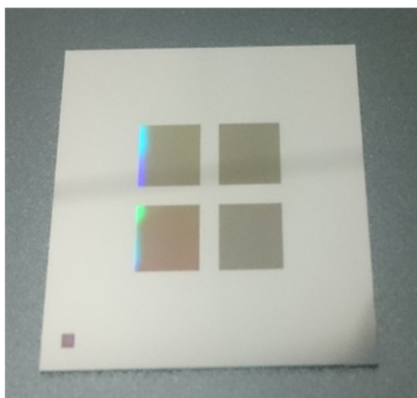


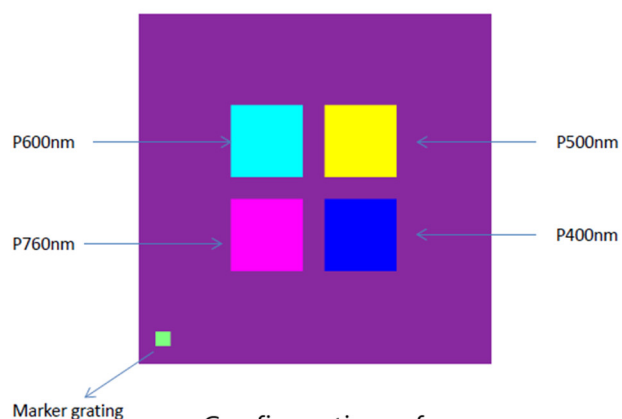
Figure S1. Schematic illustration of the fabrication process for ultrathin OPVs with 1D grating pattern by soft imprinting lithography using a PDMS mold with various pattern period. Inset figures present (a) AFM images for 1D grating patterned photoactive layers (period: 760, 600, 500, and 400 nm, depth: 55 nm), chemical structures (b) PTB7, and (c) PC₇₁BM, respectively.

(a)



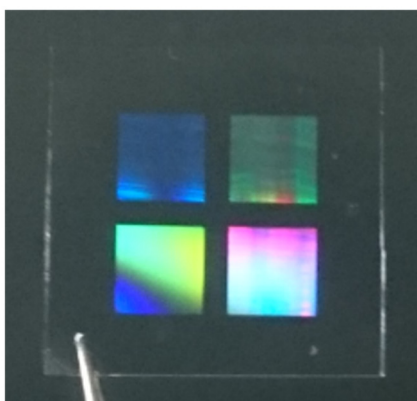
Si mold with various
1D grating pattern periods

(b)

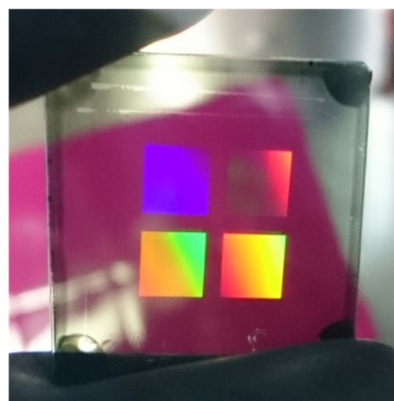


Configuration of
1D grating patterns in Si mold

(c)

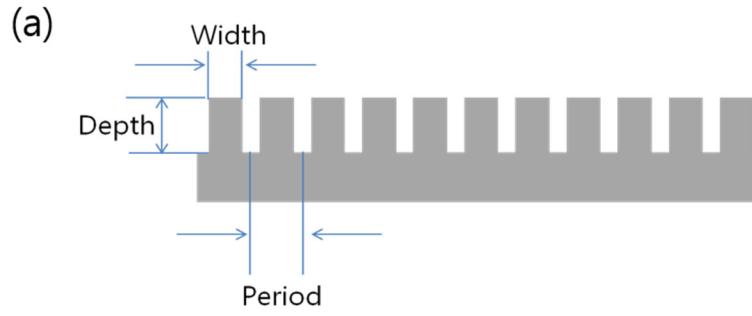


Patterned PDMS stamp



Patterned photoactive layer
on the glass/CYTOP/ITO substrate

Figure S2. Pictures show the (a) Si mold with various pattern periods of 1D gratings, (b) configuration of 1D grating patterns in Si mold, (c) patterned PDMS stamp, and (d) patterned photoactive layer on the ITO glass/supporting substrate.



- (a) Period :760nm, Width : 380nm (duty cycle : 0.5), depth : 55nm
 (b) Period :600nm, Width : 300nm (duty cycle : 0.5), depth : 55nm
 (c) Period :500nm, Width : 250nm (duty cycle : 0.5), depth : 55nm
 (d) Period :400nm, Width : 200nm (duty cycle : 0.5), depth : 55nm

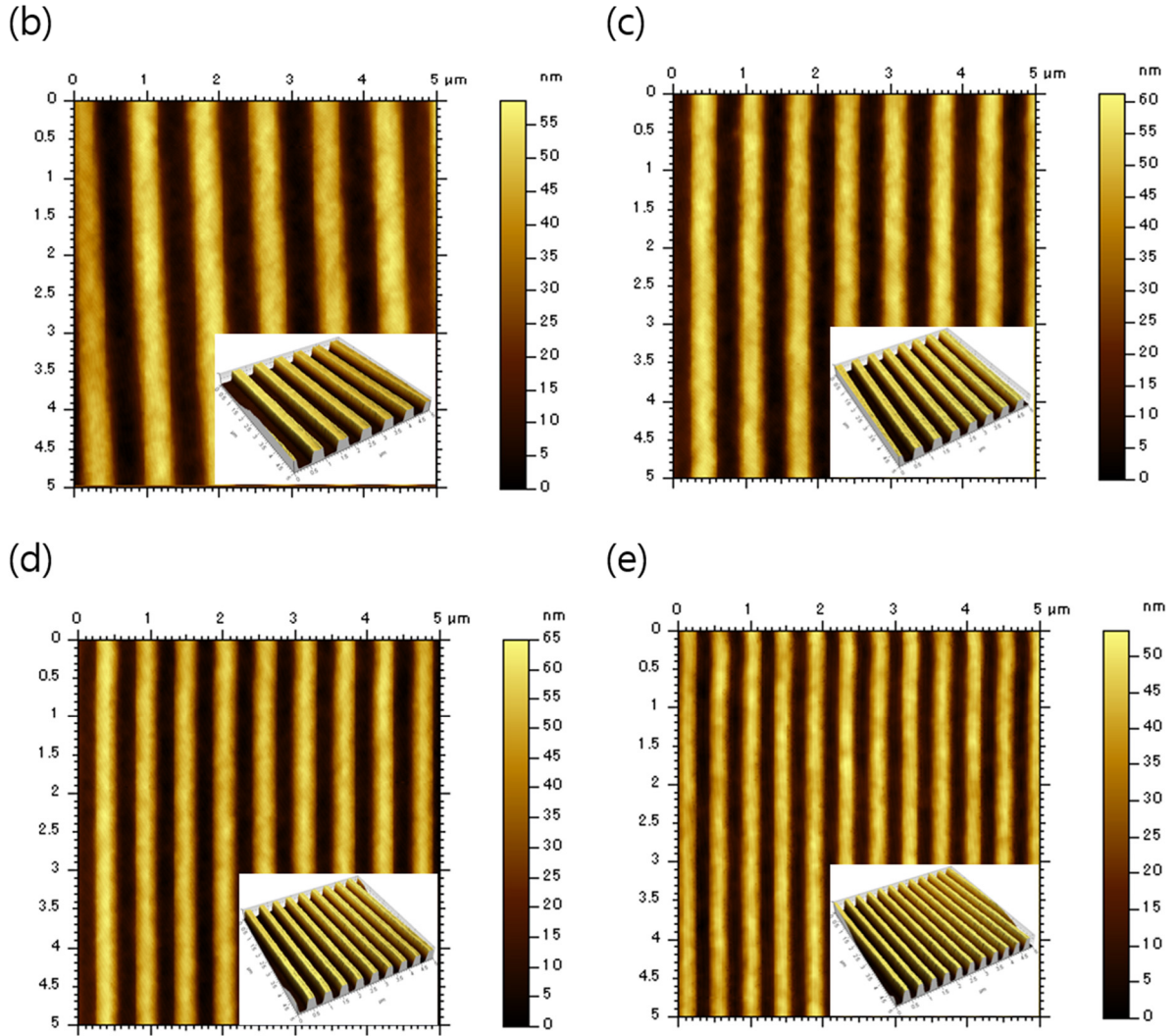


Figure S3. (a) Structure of the patterned photoactive layer. AFM images of patterned photoactive layers with various 1D gratings of (b) 760 nm, (c) 600 nm, (d) 500 nm, and (e) 400 nm, respectively. Inset shows the 3D image of various pattern period of patterned photoactive layer.

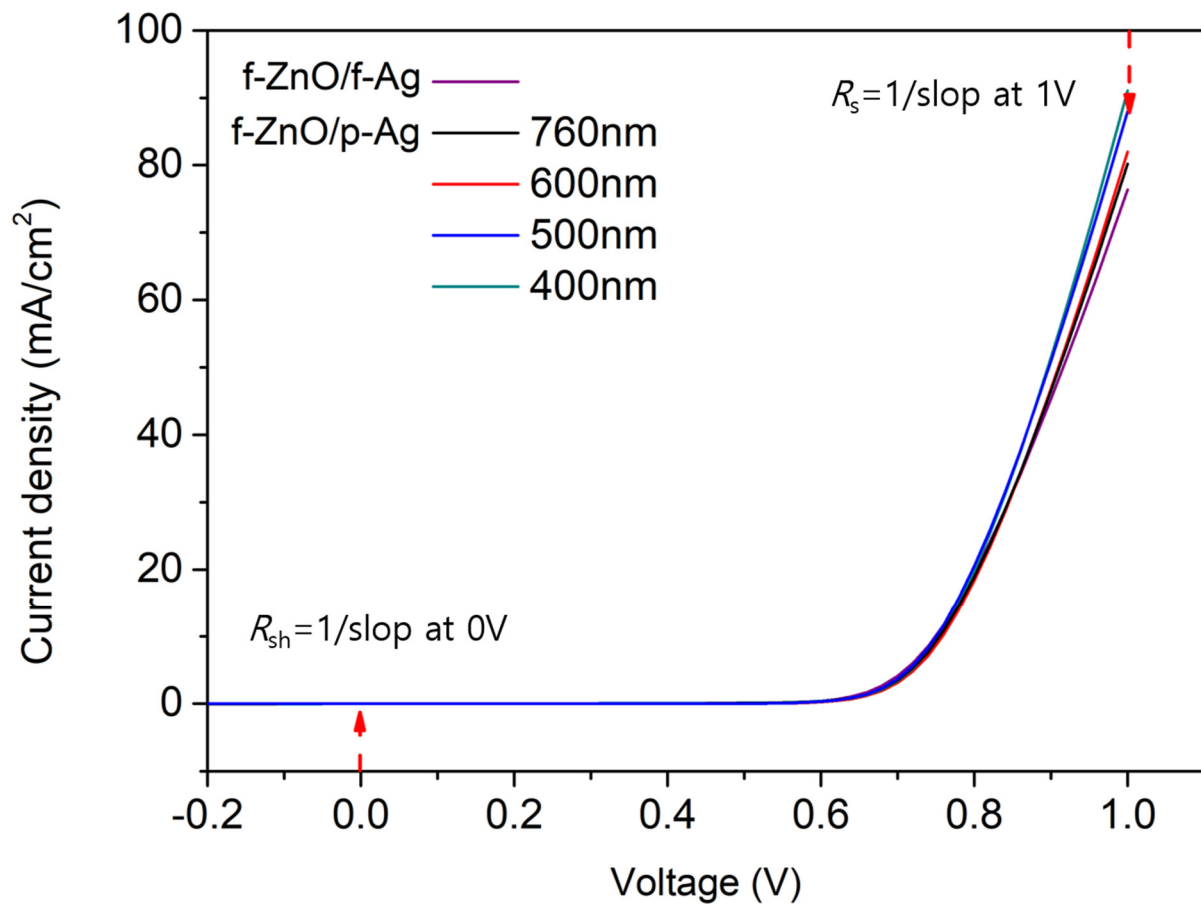


Figure S4. Determination method for series resistance and shunt resistance.

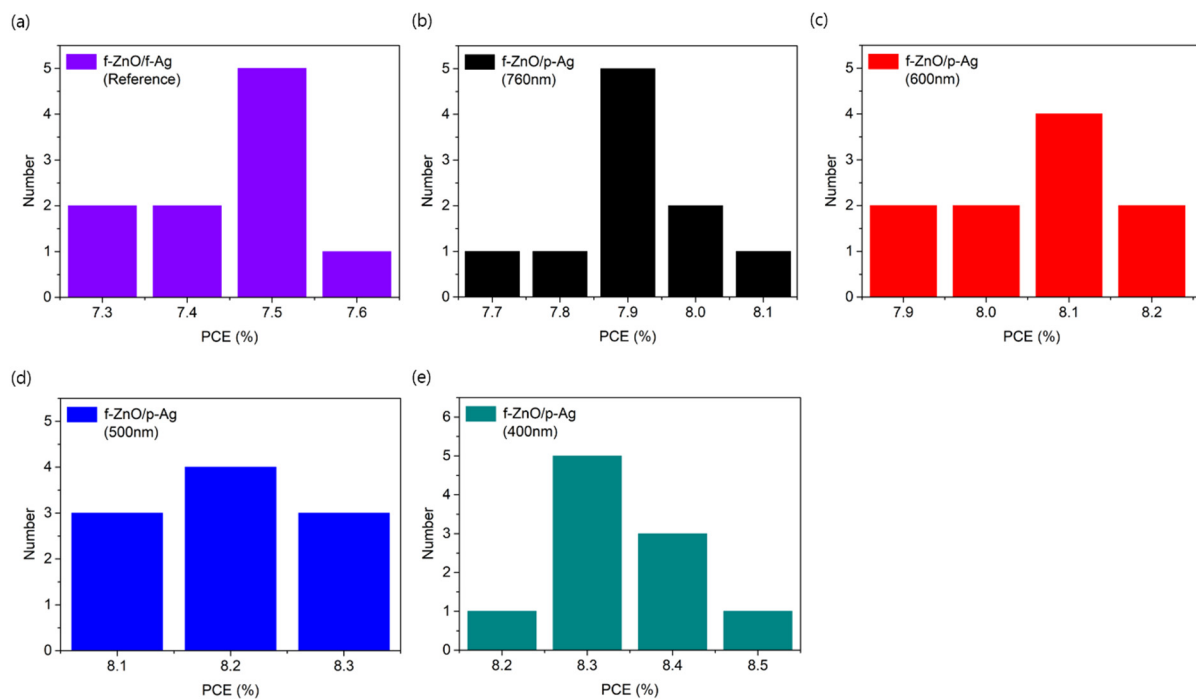


Figure S5. PCE distributions according to the ultrathin OPVs with (a) non-patterned structure, 1D grating patterns of (b) 760 nm, (c) 600 nm, (d) 500 nm, and (e) 400 nm, respectively.

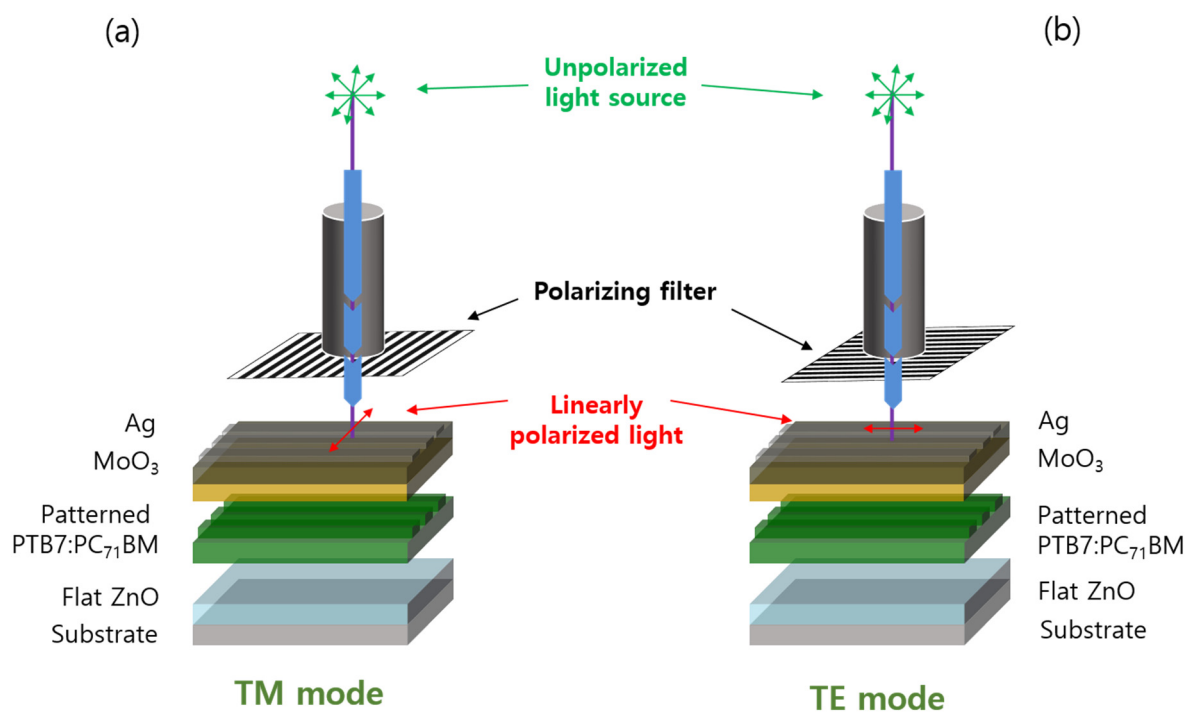


Figure S6. Schematic diagram of the measurement methods for (a) TM mode, and (b) TE mode.