

Supporting Information

Plasma Treatment of ITO Cathode to Fabricate Free Electron Selective Layer In Inverted Polymer Solar Cells

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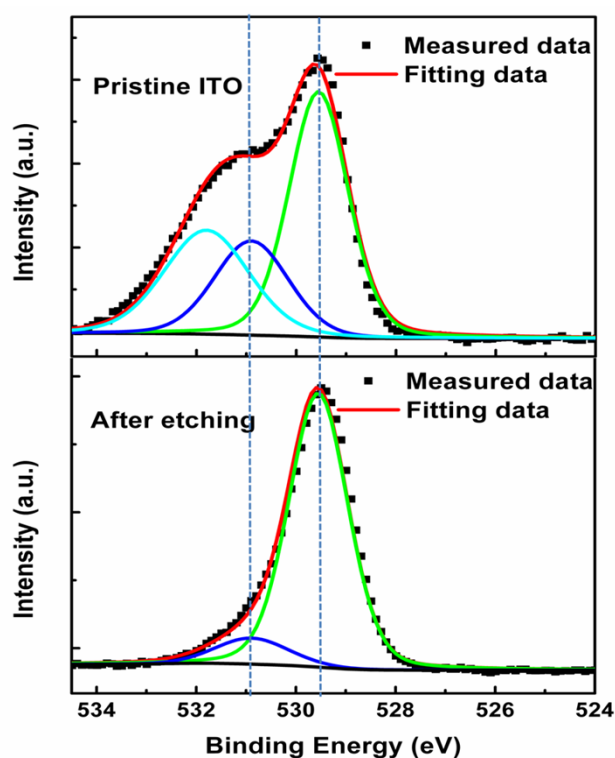


Figure S1. O1s XPS analysis of the pristine ITO and the pristine ITO after Ar⁺ etching in XPS chamber.

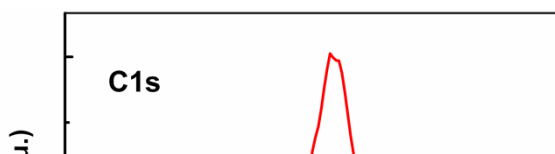


Figure S2. C1s XPS analysis of the pristine ITO and the pristine ITO after Ar⁺ etching in XPS chamber.

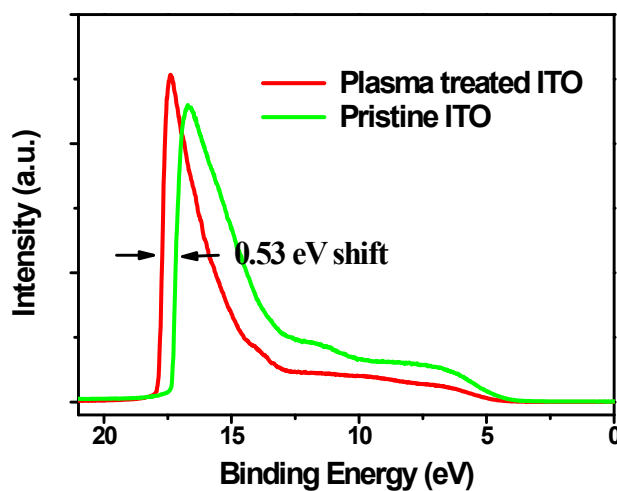


Figure S3. UPS data of the pristine ITO (green) and the plasma treated ITO (red). The analysis were performed on the Thermo Scientific Escalab 250Xi using UPS. The source of photons is HeI (21.22 eV).

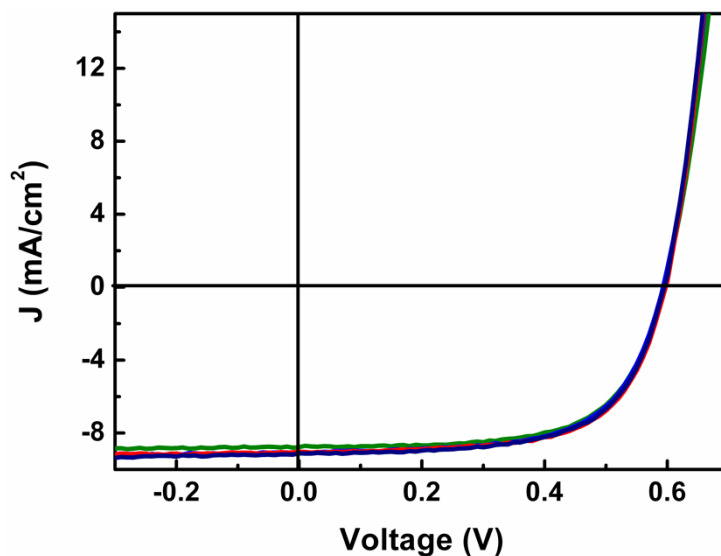


Figure S4. *J-V* characteristics of the solar cells under illumination of a batch of 4 samples with plasma-treated ITO.

Fabrication process of the device with ZnO buffer layer

Protocol of ZnO buffer Layers: zinc acetate dehydrate was dissolved in a mixture of 2-methoxy ethanol and monoethanolamine at room temperature. The concentration of zinc acetate was 0.8 M and the molar ratio of monoethanolamine to zinc acetate was 1:1. The solution was stirred for 30 min and

aged at room temperature for one day. Then the solution was spin-coated on the clean ITO at 3000 rpm for 50 s. after that the ZnO layer was baked at 200 °C for 1 hour [1].

The process of inverted device with ZnO buffer layer was fabricated as follows: 1, 2-dichlorobenzene solution composed of P3HT (Rieke Metals, 17 mg/ml) and PCBM (Nano-C, 17 mg/ml) was spin-coated onto the ZnO layer at 800 rpm for 25 s in the nitrogen-filled glove box (< 0.1 ppm H_2O and O_2) and then annealed at 110°C for 10 min. MoO_3 (10 nm in thickness) and Ag (100 nm in thickness) as electrodes were thermally evaporated onto surfaces. The structure of cell is ITO/ZnO/P3HT:PCBM/ MoO_3 /Ag, and the area of each cell is 4.5 mm².

Reference

- [1] Z. Liang, Q. Zhang, O. Wiranwetchayan, J. Xi, Z. Yang, K. Park, C. Li, G. Cao. Effects of the morphology of ZnO buffer layer on the photovoltaic performance of inverted polymer solar cells. *Adv. Funt. Mater.* 22 (2012) 2194-2201.