

## Supporting Information

### Role of additional PCBM layer between ZnO and photoactive layers in inverted bulk-heterojunction solar cells

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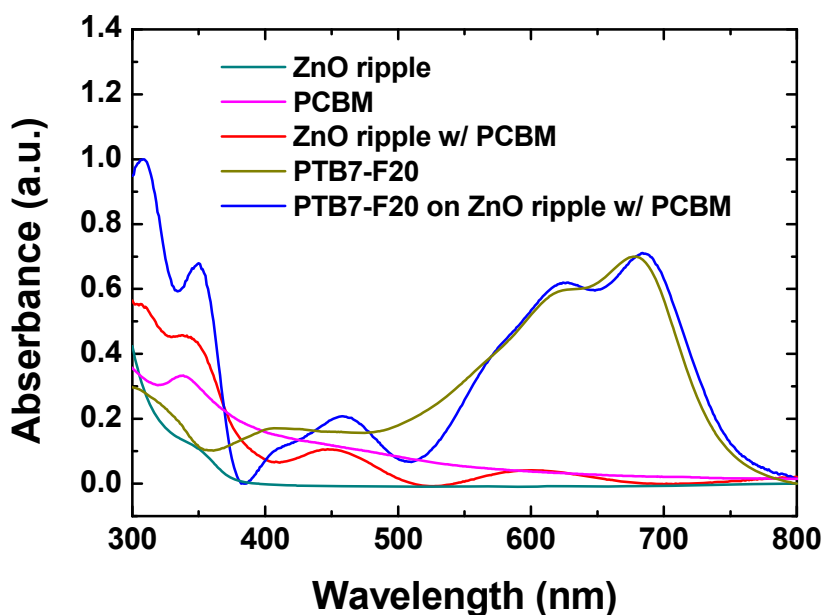
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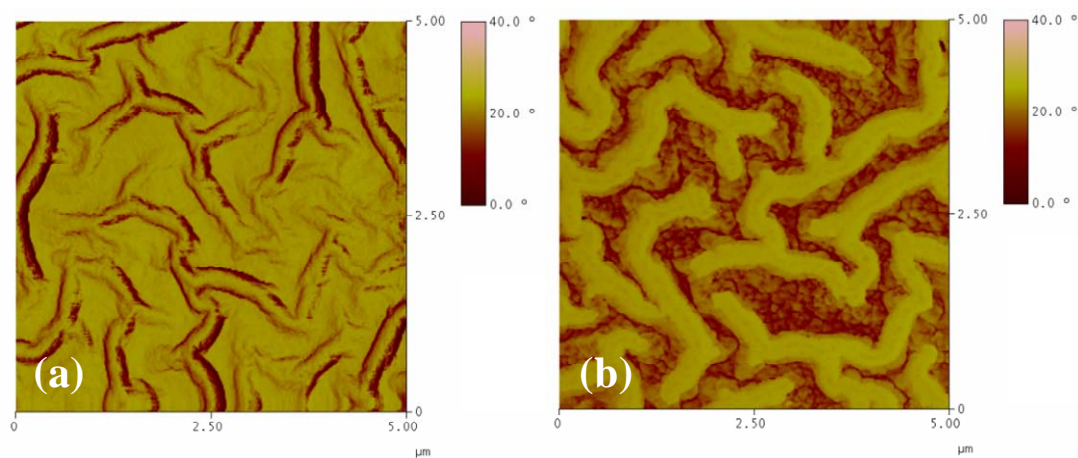
#### 1. Absorption Spectra



**Figure S1.** Absorption spectra of solar cell components.

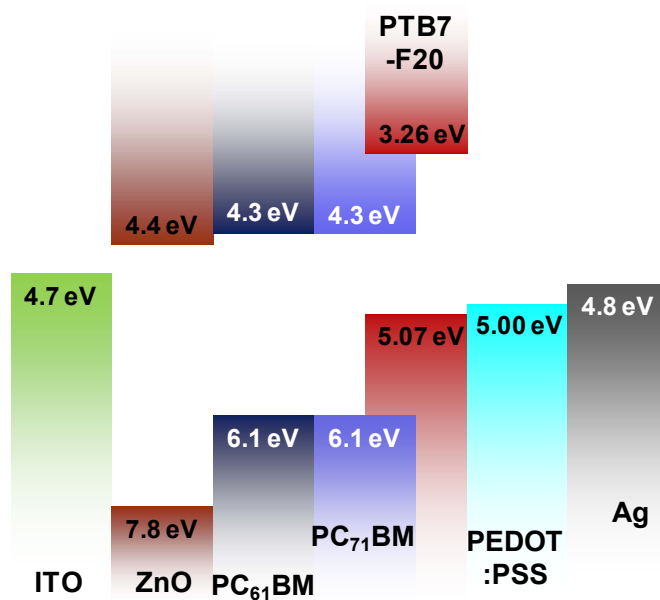
We used absorption measurements to verify if the PC<sub>61</sub>BM layer remains after deposition of the photoactive layer. Note that we used pure PTB7-F20 (without PC<sub>71</sub>BM) in this experiment. In the absorption spectrum of the ZnO ripple, there is weak shoulder peak near 350 nm, while PTB7-F20 has no absorption peak at 350 nm. The absorption spectrum measured after spin-coating of PTB7-F20 shows a strong 350 nm peak originating from PC<sub>61</sub>BM. We concluded from this observation that the underlying PC<sub>61</sub>BM layer would remain without problems during the spin-coating of the upper layers. Note that a mixture ratio of greater than 1:2 is necessary to achieve similar absorption features from a mixture of PTB7-F20 and PC<sub>61</sub>BM.

## 2. AFM phase image



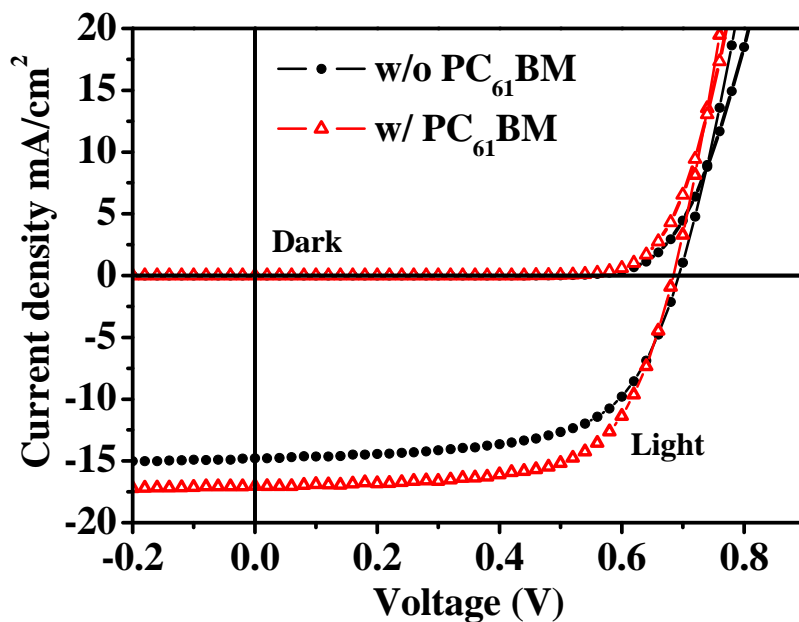
**Figure S2.** AFM phase images of ZnO ripples (a) without and (b) with PC<sub>61</sub>BM.

## 3. Full energy band diagram.



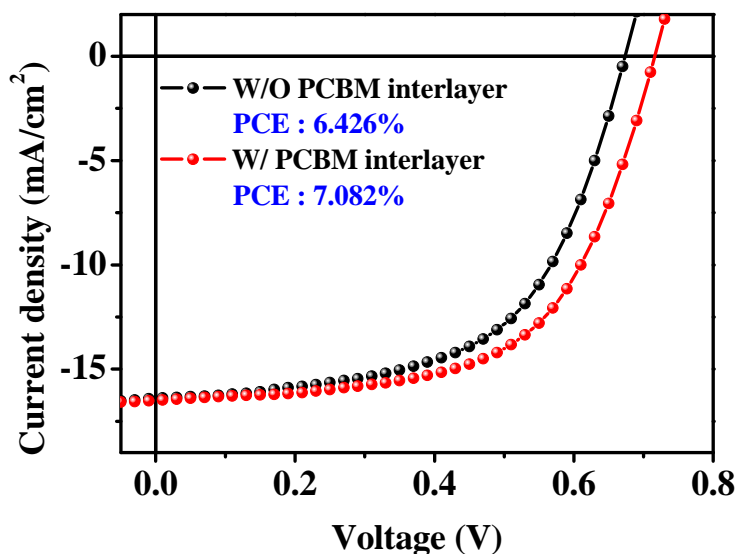
**Figure S3.** Energy band diagram of the inverted BHJ solar cells fabricated using PTB7-F20 and PC<sub>71</sub>BM.

#### 4. Dark current J-V characteristics.



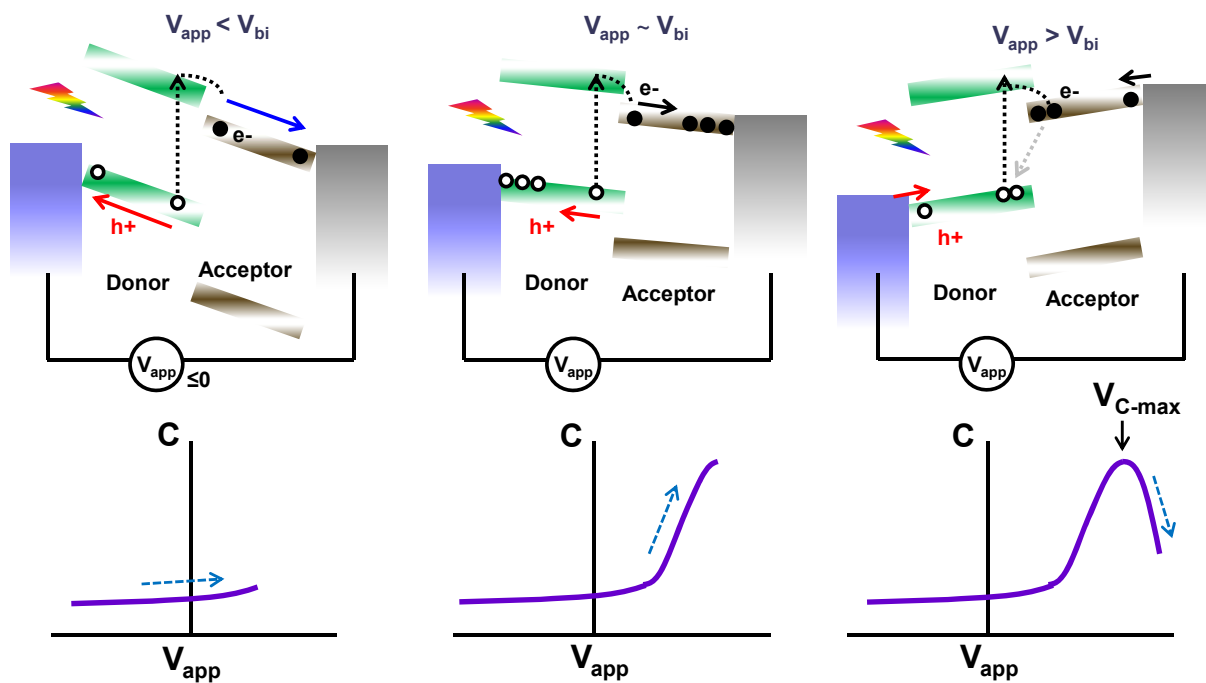
**Figure S4.** J-V characteristic curves measured with and without illumination (labeled “Light” and “Dark,” respectively).

#### 5. Solar cells with non-rippled ZnO layer.



**Figure S5.** J-V characteristics of inverted PTB7-F20:PC<sub>71</sub>BM solar cells with and without PC<sub>61</sub>BM on non-rippled ZnO layer.

## 6. Photo-assisted capacitance-voltage spectroscopy.



**Figure S6.** Schematic diagrams of photo-assisted capacitance-voltage spectroscopy measurements mechanism.