Supporting Information

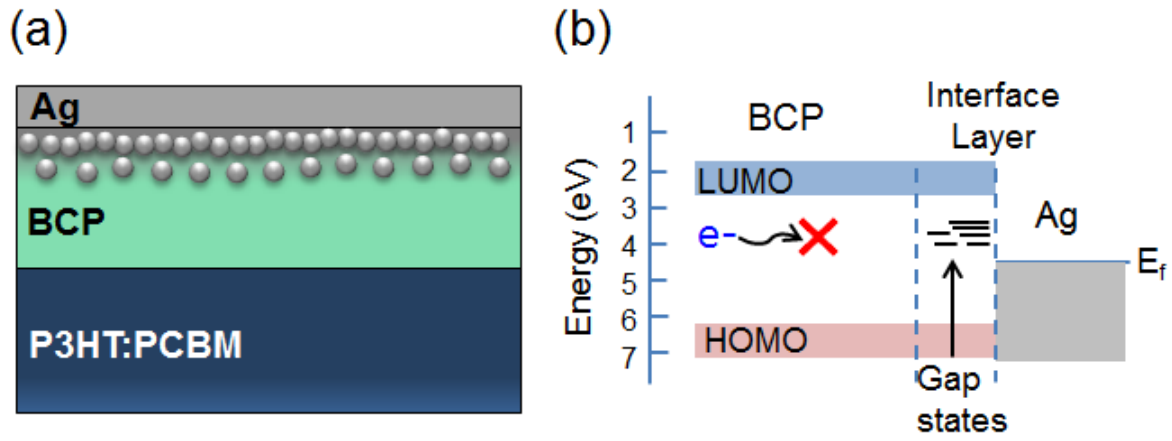

Figure 1S. (a) Structure of Ag metal-doped BCP layer on P3HT:PCBM, (b) schematic band diagram of BCP/Ag multilayer of sample (a).

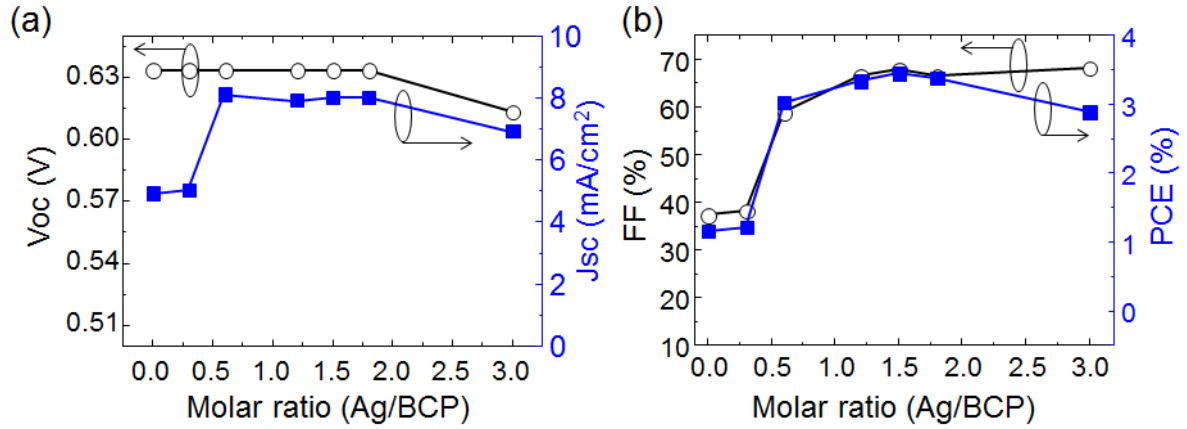

Figure 2S. Device properties as function of molar ratio of Ag to BCP. (a) open circuit voltage (Voc), short (Jsc); (b) Fill factor (FF), power conversion efficiency (PCE).

To examine the effect of metal doping on the electron transporting layer, devices with a structure of ITO/PEDOT:PSS/P3HT:PCBM/BCP:Ag (30nm)/Ag were examined as a function of doping ratio. Figure 2S(a) and (b) represents the result of an OPV device with an Ag doped BCP layer as the cathode buffer. The optimized device with a 1.5 molar ratio of Ag to BCP exhibits a J_{SC} of 8.0 mA/cm^2, V_{OC} of 0.633 V, FF of 67.9% and PCE of 3.44%. As the Ag doping ratio in the BCP layer is raised above a 1.5 molar ratio, the device efficiency degrades slightly due to segregation of Ag clusters.

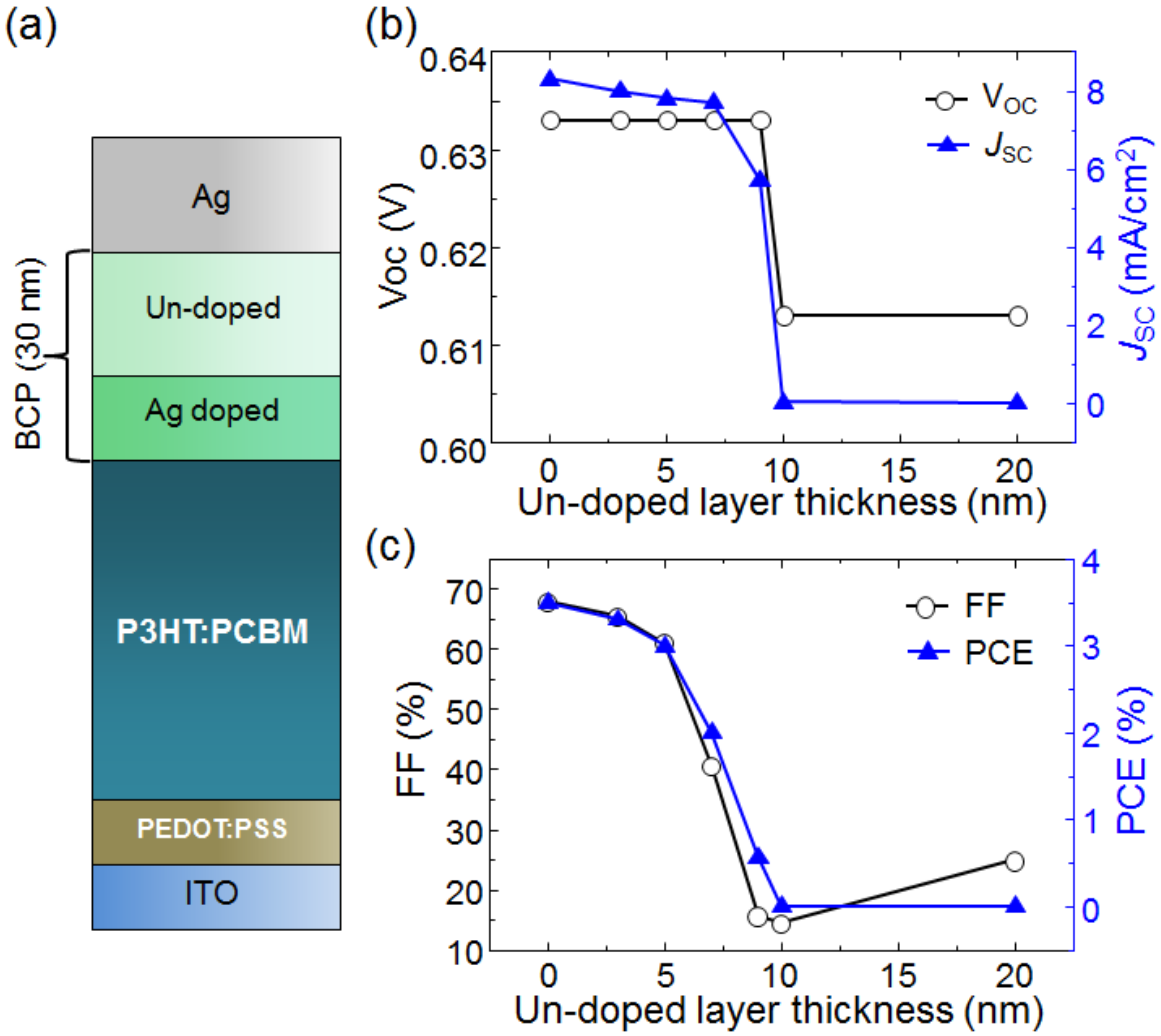

Figure 3S. (a) Schematic representation of the device with a doped/un-doped intercalation structure. The device properties as function of un-doped BCP thickness for (b) open circuit voltage (V_{OC}), short (J_{SC}), (c) Fill factor (FF) and power conversion efficiency (PCE).

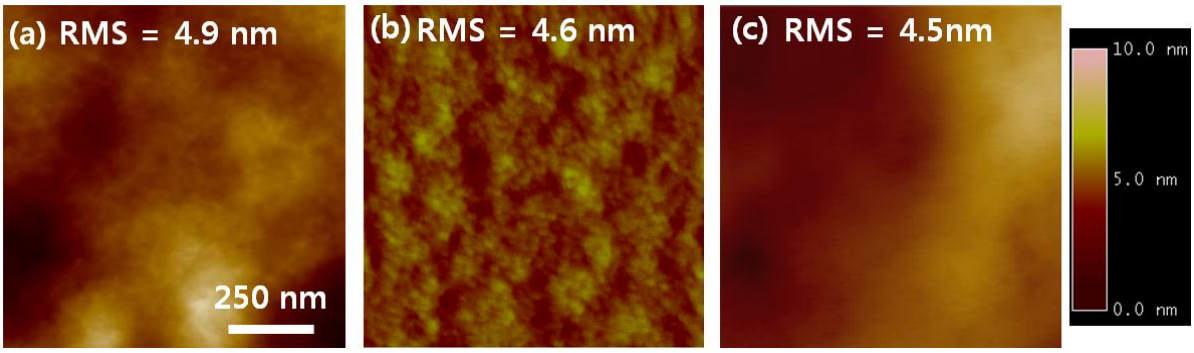

Figure 4S. AFM micrographs of a) P3HT:PCBM active lyaer, 30 nm-thick BCP on P3HT:PCBM with deposition rate of (b) 0.1 1Å/sec and (b) 5 /sec.

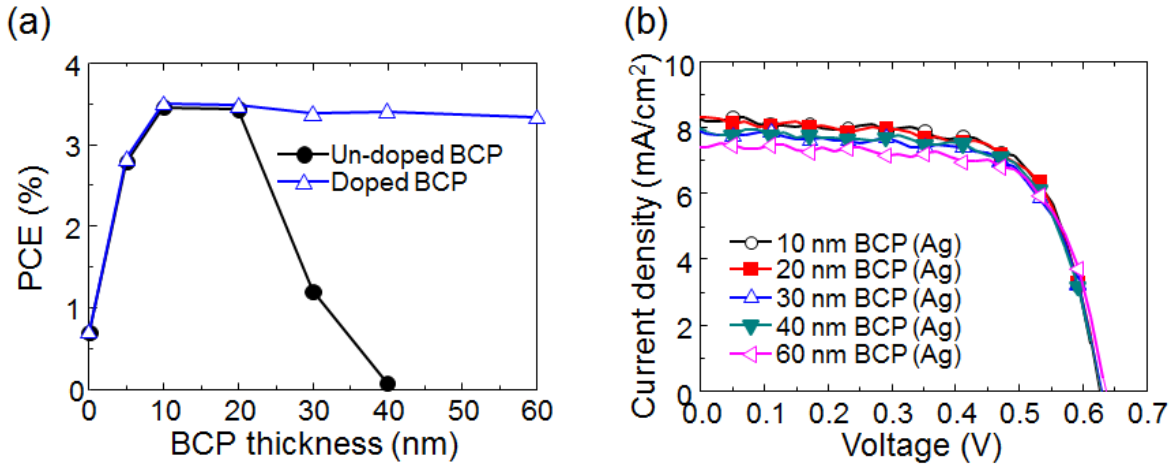

Figure 5S. (a) PCE of OPV device with an Ag doped and un-doped BCP layer as a function of BCP thickness; (b) I-V characteristics of Ag doped BCP device as a function of the doped layer's thicknesses. The device structure is ITO/PEDOT:PSS/P3HT:PCBM/BCP (Ag)/Ag.

Figure 5S shows the PCE for OPV devices with an optimized molar ratio of 1.5 and without doping as a function of the BCP layer thickness. In the case of the Ag-doped BCP, there was no degradation up to a thickness of 60 nm. However, the device with an un-doped BCP layer does not show a J_{SC} (not shown here) or PCE above 40 nm thickness. These results are represented as I-V curves in Figure 5S as a function of the Ag-doped BCP layer thickness. The similar curves mean that the Ag-doped BCP layers shows no critical dependence on Ag-doped BCP buffer layer thickness in terms of device properties. This reveals that Ag-doped BCP can be used as an electron-transporting material to enhance the performance of OPV cells.