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Improved performance in flexible organic solar cells via optimization of highly transparent silver grid/graphene electrodes

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We studied the effect of the silver grid size on graphene transparent conducting films for flexible organic solar cells (OSCs). The silver grid was used an assistant layer of the graphene to reduce the sheet resistance of substrates. Silver grid with various graphene sizes for optimizing transmittance and sheet resistance of substrates were fabricated on polyethylene terephthalate (PET) substrates to form the hybrid films. The optimized grid geometry on the single layer graphene (SLG) was the grid dimension 200 μ m × 200 μ m × 50 nm × 2 μ m (length × width × height × linewidth), where the sheet resistance was 55.73 Ω/square with the average transmittance of ~ 92.83 % at 550 nm. The properties of the OSCs fabricated using SLG with optimized silver grids on PET substrates show a short circuit current of 10.9 mA/cm², an open circuit voltage of 0.58 V, a fill factor of 60.8 %, and a power conversion efficiency (PCE) of 3.9 %. The PCE was improved about 91% than that of the OSCs using the SLG without the silver grid. These results demonstrate that the optimized grid geometry to the based on the graphene transparent electrodes contribute to improving the performance of OSCs.

Keywords: flexible organic solar cell, graphene, silver grid