

Optical manipulation of light with nanostructure by using stamping technique for enhancing the photon harvesting property in OPVs

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Organic-based optoelectronic devices, such as organic photovoltaics (OPVs) promise as low-cost and large-area electro-optical devices and renewable energy sources. However, further improvement in efficiency remains a daunting challenge due to limited light absorption in conventional OPVs. Here we report a method of optical manipulation of light by introducing nanostructure using a double side stamping technique.

Compared with the control device with a flat structure, nanopatterns that made by digital versatile disk (DVD) were introduced in electron collecting layer (i.e. ZnO) layer and photo active layer (i.e. PTB7, PCE10 as a donor polymer) in OPVs, yielding an max.10% increase in photocurrent and an improved PCE of 9.51 % without sacrificing the charge transport properties. We anticipate that our findings will promote the development of high-efficiency OPVs with new device structures.

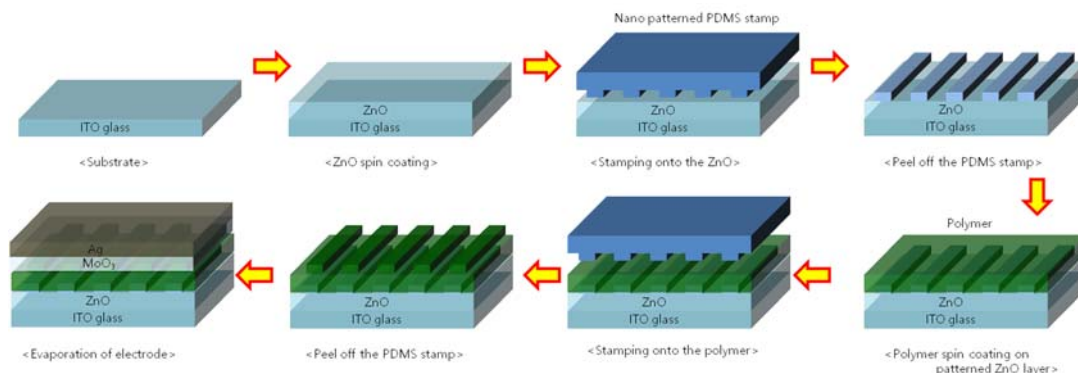


Fig. Fabrication process and device structure in this study.

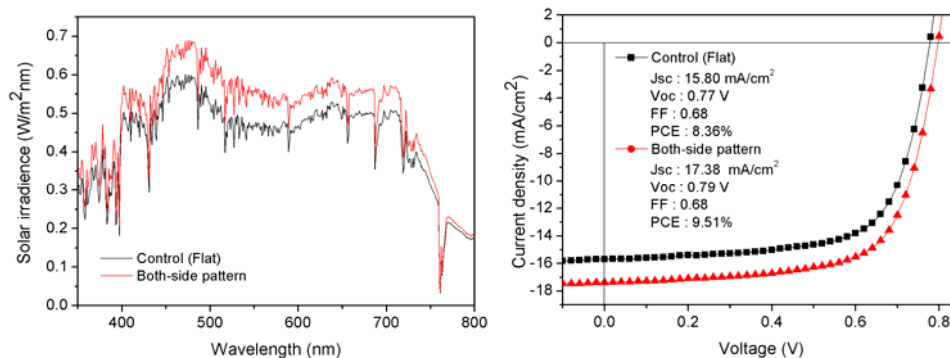


Fig. 2 Calculated solar weighted absorption property (left) and J-V characteristics of devices (right).